The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Vol. XXIII, No. 25 CHICAGO December 4, 1920

EDITORIAL DEPARTMENT—
Nathan C. Rockwood, Editor
Chas. A. Breskin, Assistant Editor

BUSINESS DEPARTMENT—
Geo. P. Miller, Manager.

EASTERN OFFICE—
Chas. H. Fuller, Manager, 101 West 41st Street, New York City, N. Y.

CIRCULATION DEPARTMENT—
H. J. Wolfe, Manager. Circulation 5300 copies net. Applicant for membership Audit Bureau of Circulation.

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TO SUBSCRIBERS—Date on wrappers indicates issue with which your subscription expires. In writing to have address changed, give old as well as new address.

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TRADEPRESS PUBLISHING CORP.
542 South Dearborn Street, Chicago, Ill.

W. D. Callender, President.
T. J. Sullivan, Vice-President.
Geo. P. Miller, Treasurer.
C. O. Nelson, Secretary.

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Round Trip Every 7 Minutes

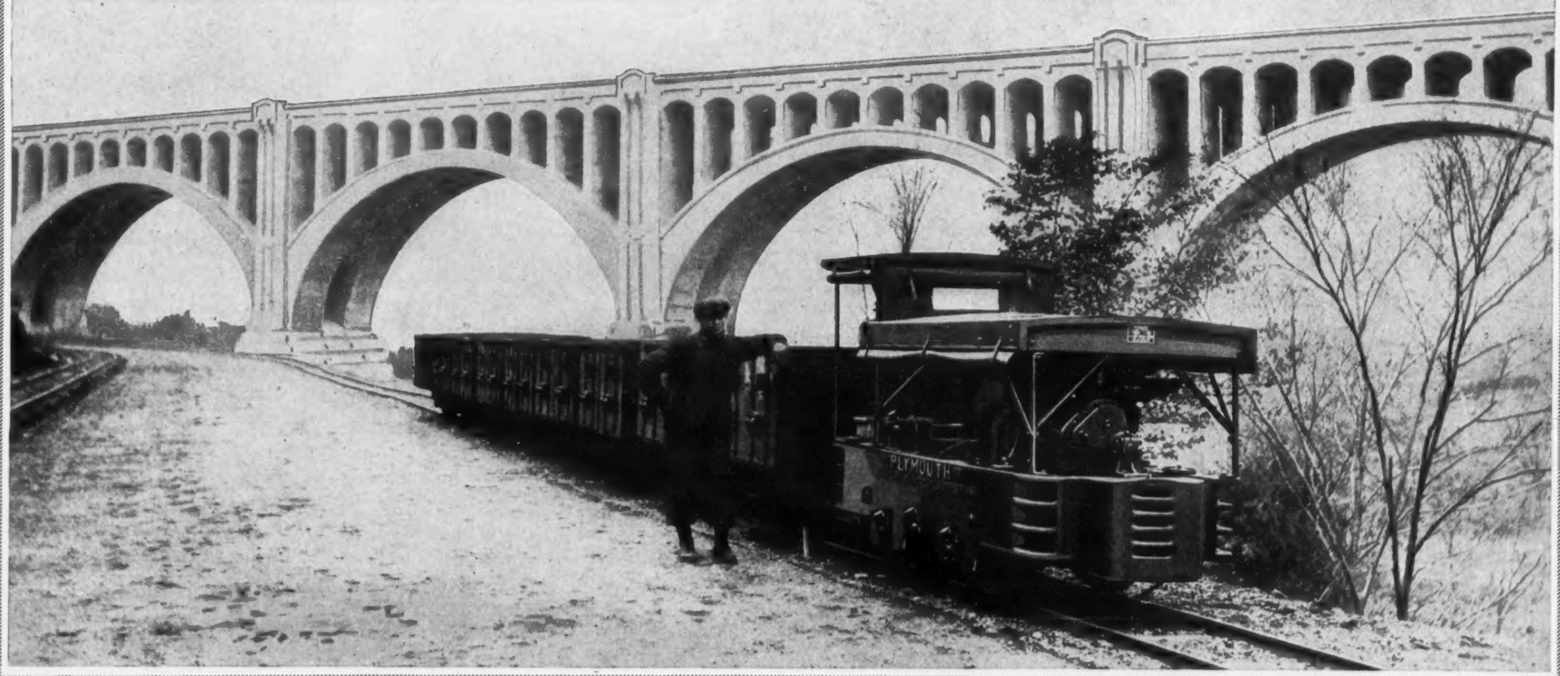
In constructing a 10 mile section of cement roadway, 24 feet wide, on the Lackawanna Trail, it was necessary for a 3-Ton PLYMOUTH Gasoline Locomotive to make 9 round trips every hour between bin and paver, hauling eight batch boxes per trip over a tenth-mile portable track, and completing five hundred feet daily.

It is shown in the illustration along side of its handiwork, proud of its share in the achievement, and eager to tackle any haul, long or short.

PLYMOUTH
Gasoline Locomotives

THE FATE-ROOT-HEATH COMPANY

Riggs Avenue. Plymouth, Ohio.



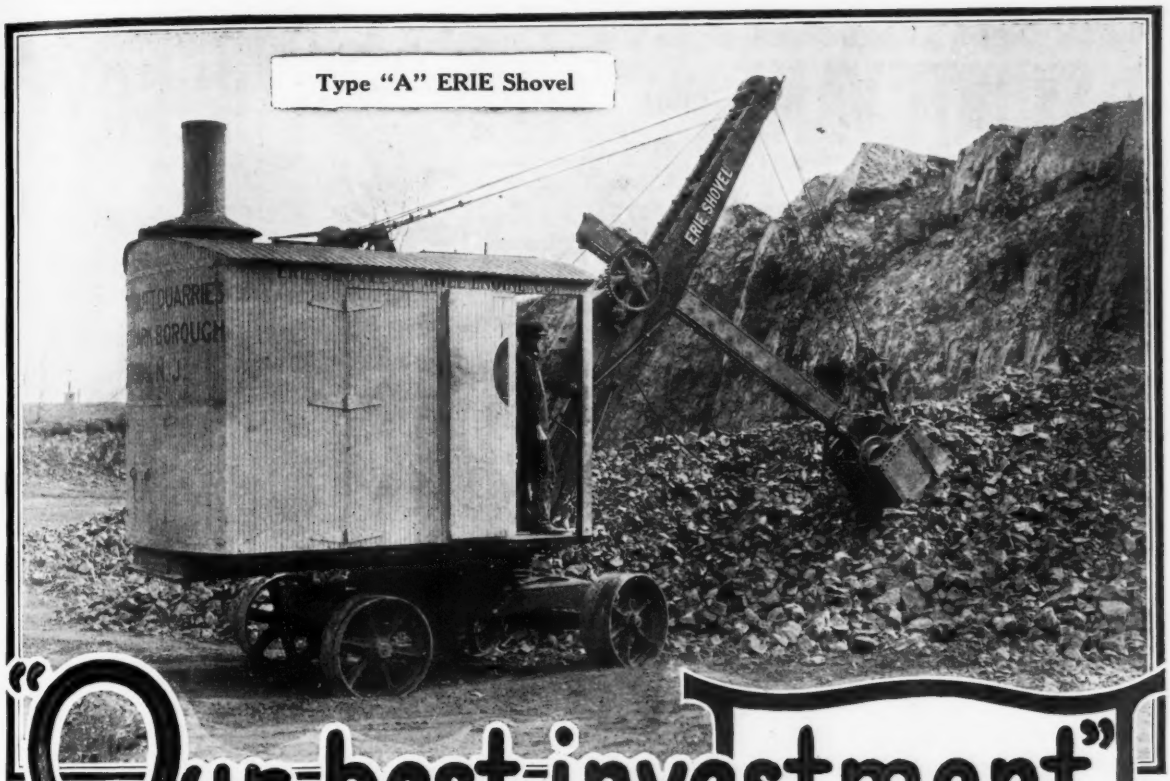
REVIEW AND FORECAST NUMBER

Published Annually CHICAGO January 1, 1921

A REVIEW of the rock products industry for the past year is no little task. Its figures and facts and the estimates on production, a resume of prices, a review of the conditions that make for increases and decreases, the car shortage and so forth is the big job our editors have been working on for months and months for the big Review and Forecast Number of *Rock Products.*

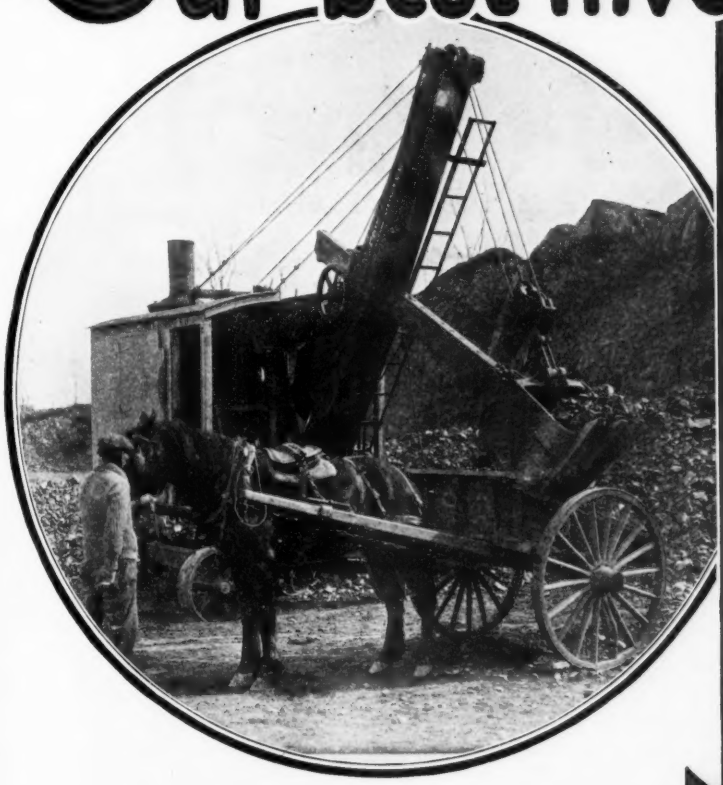
The readers of *Rock Products* are giving their usual genuine co-operation in making this big number a success. It will be of vital interest and value to the entire industry. Because of the value of this big number to the entire industry, it makes possible an extra value to the manufacturers who carry their advertising in the big number.

The Review and Forecast Number is the January First Issue of Rock Products — the Authority and Business Journal of the Rock Products Industry. Forms Close December Twenty-seventh



Type "A" ERIE Shovel

"Our best investment"



"ANYONE contemplating the purchase of a steam shovel is welcome to call at our quarry and see our two Type 'A' ERIES in operation. These 13-ton shovels load 40 cu. yds. of stone each per hour, and have an easy time of it.

"In a bank 7 ft. deep on our quarry, we did more stripping with one 'A' ERIE in five days than we accomplished in six weeks with 8 men and 4 carts.

"We can safely say that our 'A' ERIE Shovels are the best investment we have ever made."

—Letter signed by A. Vandermade, Proprietor, SOWERBUTT QUARRIES, Paterson, N. J.

Such letters as the above show that the 'A' ERIE gives excellent service in light quarry work.

Here is a real steam shovel—strongly built and very reliable, yet weighing only 13 tons in working trim! Easily and rapidly moved.

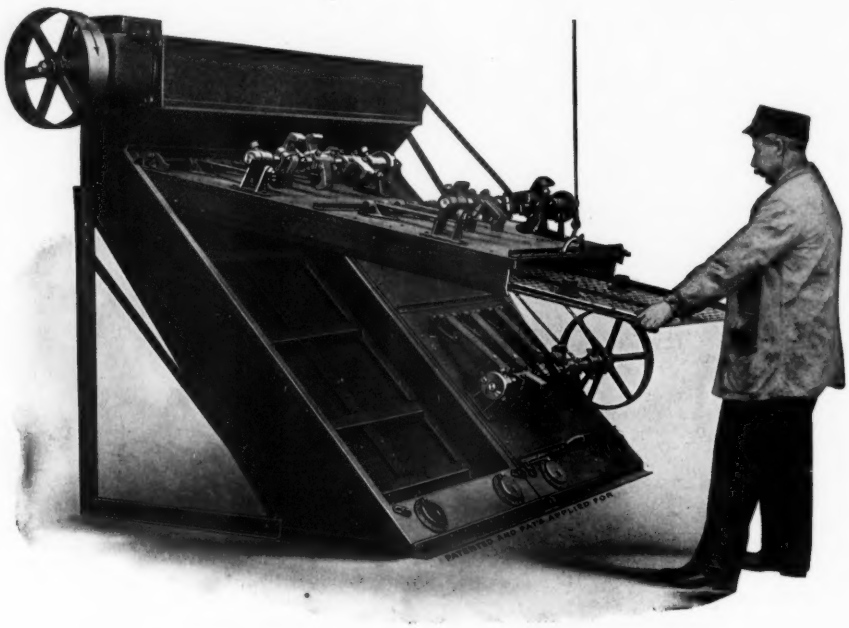
Let us send you a full description of this machine. Write for Bulletin P-22.

BALL ENGINE CO., Erie, Pa., U. S. A.

Builders of ERIE Steam Shovels and Locomotive Cranes

STURTEVANT "ONE-MAN ONE-MINUTE" "OPEN-DOOR" MACHINERY

CRUSHERS, GRANULATORS, GRINDERS, PULVERIZERS, SCREENS, MIXERS, ELEVATORS, CONVEYORS, CHUTES.



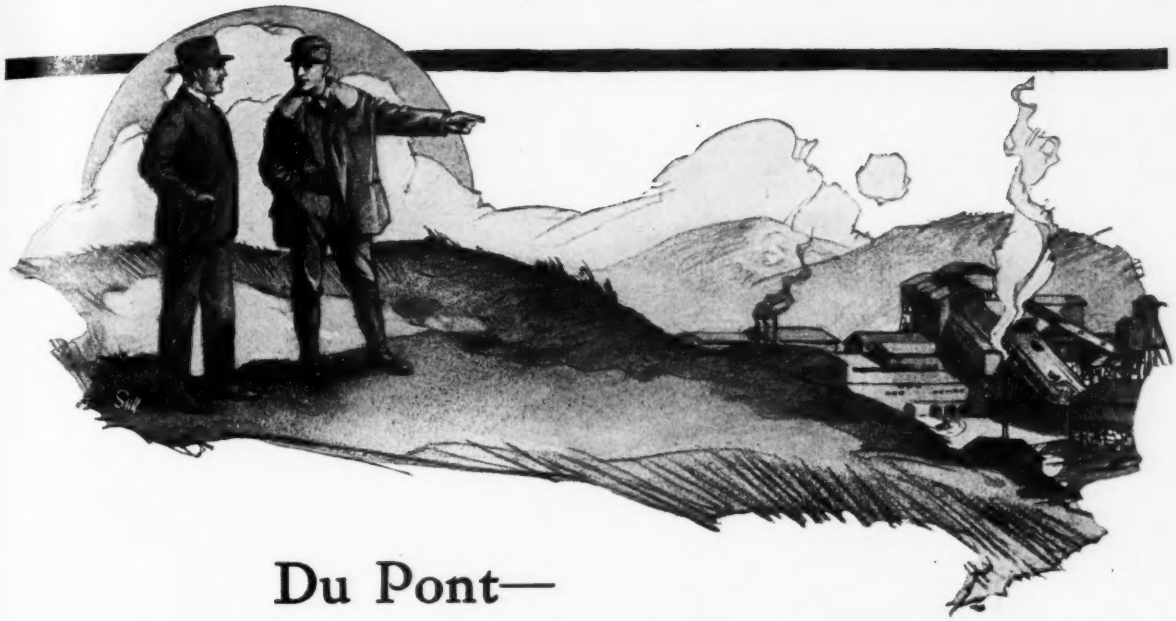
"OPEN-DOOR" STYLE M, SUPER-SCREEN

The Super-Screen not only screens everything screenable with a range of 4 to 160 mesh, giving from one to four products from one machine, but is of Sectional, or Unit, "Open-Door" construction with all parts interchangeable and of such small size that one man can handle them easily and quickly. Add sufficient number of Units to secure output wanted.

You see, one man opens the door, removes the screen frames, both scalper and fine screen, and tightens the cloth—all through the open door. A one man proposition throughout—no time or labor wasted. Keep the screen in perfect condition for maximum output.

Open-Door Super-Screens, like all other Sturtevant "Open-Door" Machines, are built for service, to give maximum profit, to do your work cheaper than any other Screen, and they last.

STURTEVANT MILL CO., BOSTON MASS.



Du Pont—

First in the Confidence of the User

WE have in our employ a large percentage of the recognized explosives experts in this country. Their knowledge of the business is kept constantly up to the minute through the work of the Du Pont Laboratories and Experimental Stations and through close contact with the latest developments in the field.

Many users of explosives have profited by securing the advice and assistance of these Du Pont Field Men in solving their own particular problems. It is a fact that their practical knowledge is saving hundreds of thousands of dollars for our customers every year.

It is perhaps this particular feature of Du Pont Service, more than any other—coupled with the unfailing uniformity of Du Pont Quality—which has made Du Pont first in the confidence of the user of explosives.

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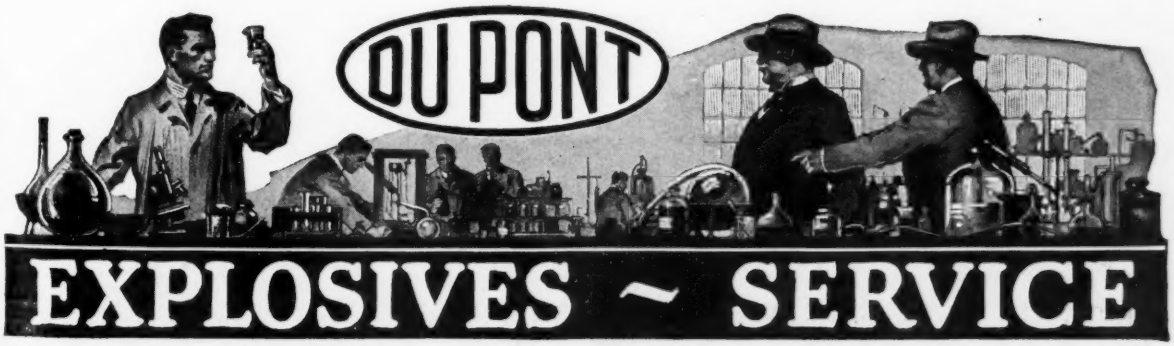
E. I. DU PONT DE NEMOURS & CO., Inc.
Sales Department: **Explosives Division**
WILMINGTON, DELAWARE



PIERCE-ARROW 2-ton, 3½-ton, 5-ton Dual Valve Trucks Mean Added Power

Increased valve area—
larger intake and quicker exhaust—
and complete gasoline consumption
assure full power delivered by
each explosion of gas.

THE result not only is power equal to any demand, but many signal economies: time-saving, easy handling, minimum strain, labor saving and surprisingly small gasoline consumption.

All of these savings reduce cost of operation and increase profits to the owner.

When writing advertisers please mention ROCK PRODUCTS

PIERCE-ARROW has been noted always for freedom from breakdowns and minimum repair expense. The accessibility of every part materially cuts down labor cost of necessary repairs. Keeping trucks running is an essential of successful operation and a major Pierce-Arrow objective.

Pierce Arrow

48 of the FIRST FIFTY trucks still running after 9 years' service.

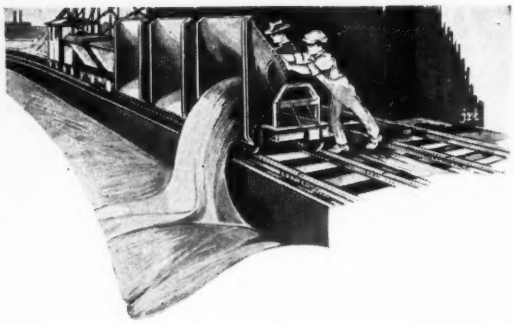
Delivers more work in a given time.

Loses less time on the job and off the job.

Costs less to operate and less to maintain.

Lasts longer, depreciates less, commands a higher resale price.

THE PIERCE-ARROW MOTOR CAR COMPANY, BUFFALO, N. Y.



Reclaiming Valuable By-Products From Wastes With

VULCAN ROTARY KILNS

Sugar beet slime, lime sludges from wood pulp made by the sulphate process, and other once objectional industrial sludges and dry wastes are treated in VULCAN Rotary Kilns to reclaim by-products formerly lost.

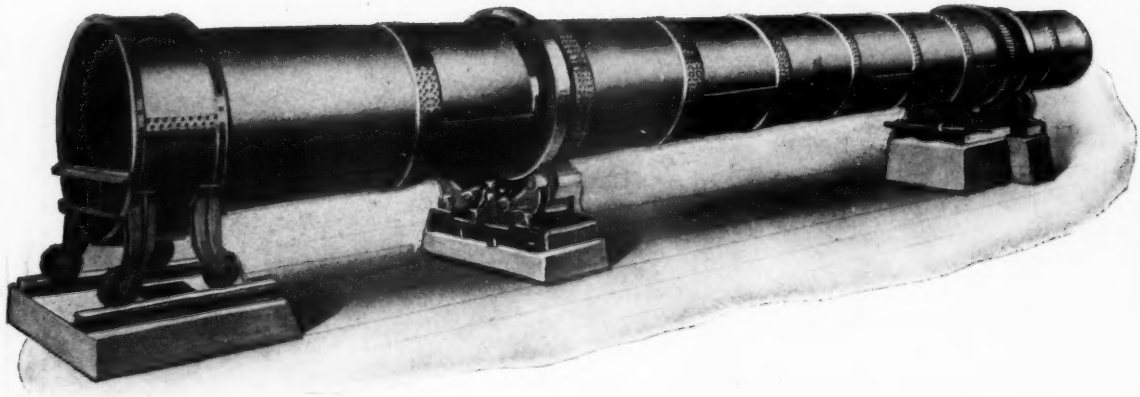
Carbonate of lime is one of these by-products secured from sugar beet slime and wood pulp sludges after treatment in VULCAN Rotary Kilns.

Sixty-five widely different processes find their economical solution in the use of rotary kilns.

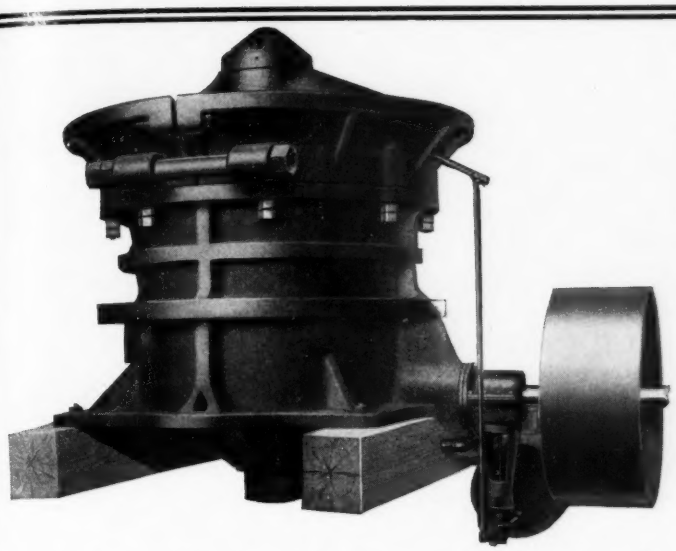
Perhaps some of your industrial wastes would be convertible into valuable by-products by a suitably designed rotary kiln.

Your inquiry is invited

VULCAN IRON WORKS
"Established 1849"
1753 Main St., Wilkes-Barre, Pa.



When writing advertisers please mention ROCK PRODUCTS



PEOPLE WHO KNOW TELSMITH CRUSHERS

In two columns, right next to this paragraph, are the names of just a few people who can and will tell you all that is good, bad or indifferent about the Telsmith Primary Breaker. Right now, before you forget it, sit down and write them a few questions. For instance, you can ask them—

Is Telsmith's central shaft really unbreakable?

Is Telsmith's parallel stroke particularly effective in gripping big rock, as claimed by the manufacturers?

Are Telsmith eccentric bearings as large as claimed and do they stand up?

Is Telsmith's capacity satisfactory? Is the power consumption as low as claimed?

If you have not made a first-hand study of Telsmith pillar-shaft crusher, you will be surprised at the replies received.

Glad to send you catalog No. 166 (Telsmith Primary Breakers) and bulletin No. 2-F-11 (Telsmith Reduction Crushers).

SMITH ENGINEERING WORKS
3188 Locust St., Milwaukee, Wis.

Telsmith Sales Offices and Agencies

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710 Witherspoon Bldg., Philadelphia, Pa.
930 Oliver Bldg., Boston, Mass.
6110 Euclid Ave., Cleveland, O.
827 Summit St., Toledo, O.
325 W. Main St., Louisville, Ky.
Chester, Fla.
2540 University Ave., St. Paul, Minn.
110 W. Park Way, N. S., Pittsburgh, Pa.
Franklin & Channing Aves., St. Louis, Mo.
Bowman Hdwe. Co., Omaha, Neb.
Salt Lake Hdwe. Co., Salt Lake City, Utah
Road Builders' Equip. Co., Portland, Ore.
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E. J. Lavino & Co., Philadelphia, Pa.
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American Cement Plaster Co., Akron, N. Y.
York Valley Lime & Stone Co., York, Pa.
Thomasville Lime & Stone Co., Thomasville, Pa.
Standard Chemical Co., Canonsburg, Pa.
Advance Industrial Supply Co., Greenstone, Pa.
W. F. Woodruff, Louisville, Ky.
Kentucky River Stone & Sand Co., Lawrenceburg, Ky.
Webster Stone Co., Irvington, Ky.
American Cement Plaster Co., Gypsum, Ohio
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Metronite Co., No. Milwaukee, Wis.
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Prince Johnson Limestone Co., Kansas City, Mo.
Quenelda Graphite Corp., Lineville, Ala.
A. R. Young Construction Co., Clarksville, Ark.
Southern Granite Co., Little Rock, Ark.
Plymouth Gypsum Co., Ft. Dodge, Iowa
Liberty Bell Gold Mining Co., Telluride, Colo.
Tomboy Gold Mining Co., Telluride, Colo.
Evergreen Mines Co., Apex, Colo.
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Storey Rock Co., Bozeman, Mont.

RAYMOND
PULVERIZING
AIR-SEPARATING
SYSTEM
CHICAGO-U.S.A

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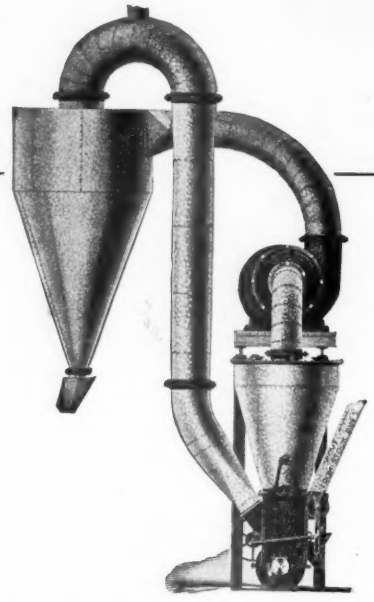


Next Spring Will See the Demand for Hydrated Lime Enormously Increased With the Renewal of Building Activity

Now Is the Time to Begin Thinking of Overhauling Old Plants, Installing New Equipment and Increasing Plant Capacities

A good many of our customers, both new and old, who manufacture hydrated lime realize the enormous demand which is bound to come with renewal of favorable building conditions and are at the present either considering new equipment or have already placed their orders.

Raymond Air Separating Equipment, because of its large capacity with low power consumption and low cost of repairs, has firmly intrenched itself in the lime industry, becoming known as a standard in many plants.

It not only air separates the hydrate into a smooth finished product but also eliminates the impurities like core, sand, and unburnt lime without loss of good hydrate such as occurs with screens.

An investigation will convince you, and remember, now is the time to consider changes in your plant in order to insure delivery and installation before the Spring demand begins.

RAYMOND BROS. IMPACT PULVERIZER CO.

1301 North Branch Street **Chicago, Ill.**

Western Office: 201 Boston Bldg., Denver, Colo.
Eastern Office: 5th Floor, Grand Central Palace, New York City

BALDWIN

Locomotives for the Rock Products Industry

We are always at the service of owners of Cement, Lime, Sand, Gravel, Gypsum, Rock Phosphate and Sand Glass Plants; Stone Quarries and Industrial Coporations of any kind to design locomotives best suited for their particular operating conditions.

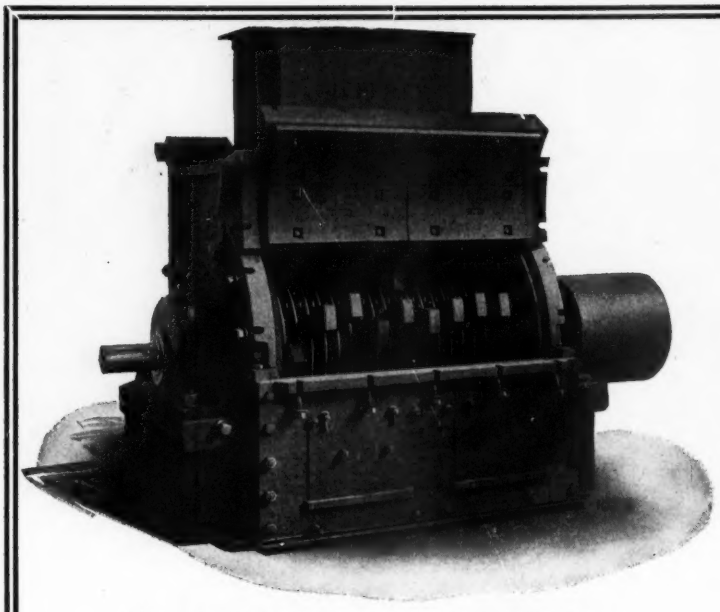
Our nearly ninety years of experience in building locomotives of all types—for every purpose and to be used under every sort of operating condition, fully qualifies us to design engines to meet your special needs.

The more than 54,000 locomotives which have carried the Baldwin Badge plate are our best recommendation.

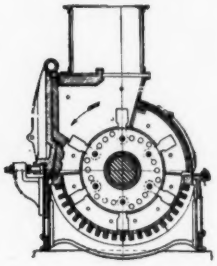
The Baldwin Locomotive Works

PHILADELPHIA

LOCOMOTIVES



Note: Accessibility, Compactness and Ball Bearings



Sectional View of Pulverizer Showing Top Feed

Jeffrey TYPE "B" Ball Bearing Swing Hammer Pulverizer

for Breakdown of Large Pieces of Limestone, Gypsum, Shale, etc.

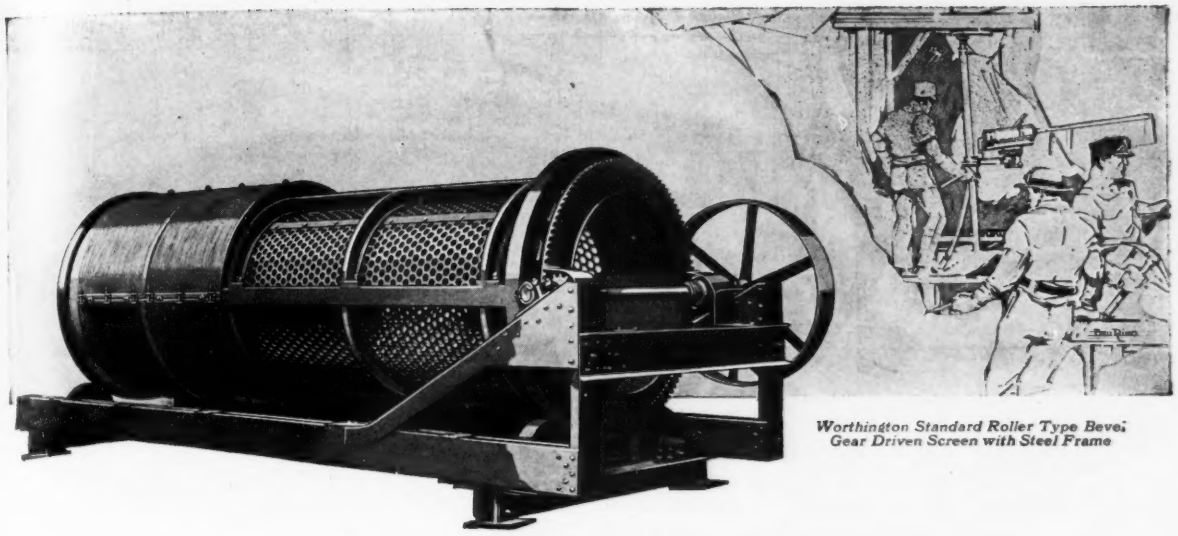
Leading Cement Mills, Lime Plants, Quarries, Gypsum Plants, etc., are being equipped with Jeffrey Swing Hammer Pulverizers to meet the constantly increasing demands.

Write for Pulverizer Catalog No. 147-D

The Jeffrey Mfg. Co. 935 North Fourth St. Columbus, Ohio

New York, Boston, Scranton, Buffalo, Philadelphia, Cleveland, Pittsburgh, Chicago, St. Louis, Birmingham, Charleston, W. Va., Dallas, Milwaukee, Los Angeles, Denver, Montreal, Detroit

Manufacturers of Pulverizing, Conveying and Elevating Machinery; Chains; Self-Propelling Loaders; Electric Trolley and Storage Battery Locomotives, etc.



Worthington Standard Roller Type Bevel Gear Driven Screen with Steel Frame

What Worthington have to offer you

SINCE proper selection and installation of machinery determine plant efficiency, Worthington maintain at their Power and Mining Works, Cudahy, Wis., a corps of engineering experts for your advice and help.

As companion apparatus to the Screen illustrated at the head of this page, Worthington build Superior McCully Gyratory Crushers, Superior Jaw Crushers, Rotary Kilns, Dryers, Coolers, Elevators, Tube Mills and Ball Compartment Mills. Many of these machines incorporate particular Worthington construction features as for instance, Superior McCully suspended short shaft and force-feed lubrication.

Then too, sponsoring these machines is the great, big Worthington organization since 1840 world's standard for pumps and pumping machinery.

Other Worthington Products

Gyratory Crushers, Jaw Crushers, Air Compressors, Mine Pumps, Revolving Stone Screens, Ball and Tube Mills.

To further enlarge their service, Worthington have acquired the good-will and mechanical equipment of the Platt Iron Works, Dayton, Ohio, for manufacturing Oil Mill Machinery, Hydraulic Turbines, Feedwater Heaters and High Pressure Air Compressors.

WORTHINGTON PUMP AND MACHINERY CORPORATION
***Executive Offices:* 115 Broadway, New York City**
Branch Offices in 24 Large Cities

PUMPS—COMPRESSORS—CONDENSERS—OIL & GAS ENGINES—METERS—MINING—ROCK CRUSHING & CEMENT MACHINERY

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Snow-Holly Works *Buffalo, N. Y.*
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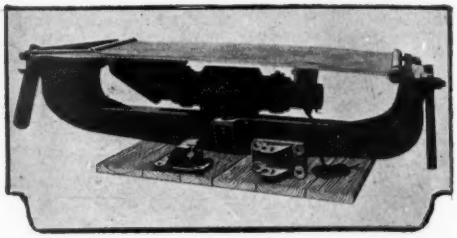
When writing advertisers please mention ROCK PRODUCTS

MITCHELL
ELECTRIC VIBRATING
SCREEN



"Has Paid for Itself Several Times Over"

—Says Golden Cycle Mining Company

The Golden Cycle Mining Company, of Colorado, reports that its Mitchell Screen paid for itself two or three times over *in the short space of four months.*

In other words, the Mitchell, by cutting down power consumption, decreasing operating expense and increasing tonnage handled, showed, within four months, a gain several times greater than its original cost.

The Mitchell cuts down power bills, because it requires only 3/8 H.P. per day to run it. And it increases tonnages handled because it vibrates the screen cloth 3600 times a minute and forces it up into the material with an impact of 500 to 1000 pounds.

It doesn't seem to make any difference what kind of material the Mitchell is required to handle —coarse or fine, wet or dry—it shows the same remarkable improvement over other types of screens. This fact is being demonstrated in eight different industries under a big variety of operating conditions.

Every day adds to the data on Mitchell Electric Vibrating Screen efficiency—data we shall be glad to submit to you on request

Stimpson Equipment Company

MANUFACTURERS AND SOLE AGENTS

315 Felt Building **Salt Lake City, Utah**

The DAVIS No. 1 Blaster

A lightweight machine for firing shots

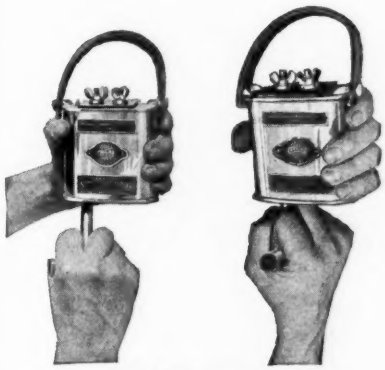
The many advantages of electrical firing, even in small shots, have created a need for a compact, lightweight blasting machine designed especially for firing a small series of shots. To fulfill this need the Davis No. 1 Blaster was developed.

This machine, which is small and convenient to handle, weighs only 3¼ pounds. It is very powerful for its size and develops ample current to fire 5 thirty-feet copper wire or 5 six-feet iron wire Electric Blasting Caps, connected in a single series.

This type of blasting machine is particularly suited for coal mine blasting and for all other operations where not more than five shots are fired together.

The key by which the Davis No. 1 Blaster is operated is a separate part of the machine and may be kept in the possession of the shot-firer, preventing the operation of the machine by any other person. This is an important safety feature.

Deliveries can be made promptly from all distributing points. Requests for prices and more complete information will be given our most careful attention. Ask for Davis No. 1 Blaster circular.



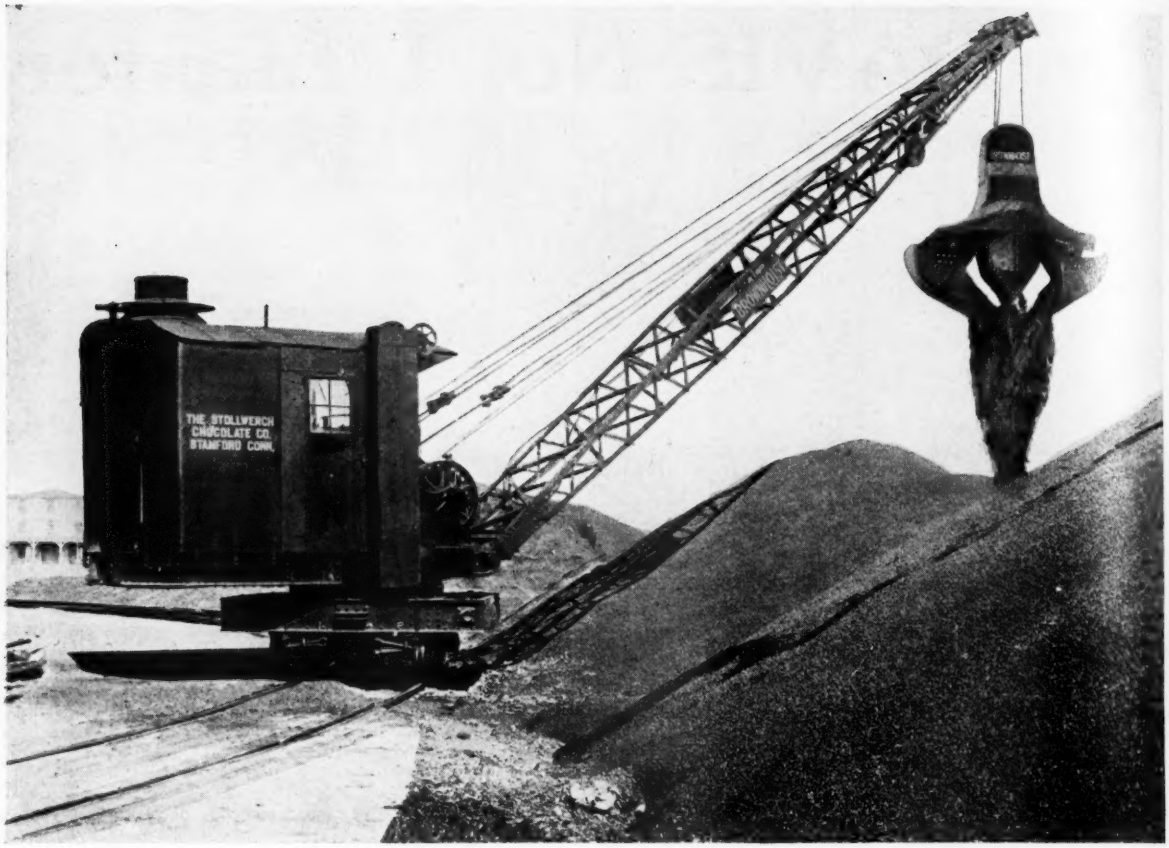
Simple in Operation

Connect leading wires to binding posts. Hold the machine in the left hand (top of machine away from operator). Insert the key with right hand, in the slot at the bottom of the machine. Give the key a quick twist to the right as far as it will go. One turn is sufficient.

ATLAS POWDER COMPANY
140 North Broad Street, Philadelphia

Branch Offices: Allentown, Pa.; Birmingham, Ala.; Boston; Chicago; Des Moines, Ia.; Houghton, Mich.; Joplin, Mo.; Kansas City; Knoxville; McAlester, Okla.; Memphis; Nashville; New Orleans; New York; Philadelphia; Pittsburg, Kans.; Pittsburgh, Pa; Pottsville, Pa.; St. Louis; Wilkes-Barre.

Atlas Explosives



Saving Labor at the Storage Pile

The high cost of labor caused the Stollwerck Chocolate Company to look around for a more economical way to handle its coal and other bulk materials. Few people would have believed that a locomotive crane could pay for itself in a chocolate factory before this Brownhoist Locomotive Crane was put on the job. But the crane has been a great labor and money saver for its owners. And with the large reserve coal storage yard shown above, they are not worried by the coal shortage which may tie up some plants this winter.

The Brownhoist not only handles the coal at the storage pile but will place it directly into the bins in the boiler room. Besides it switches the cars and can be used for all kinds of handling around the plant, making it an all-purpose crane.

If you have coal or bulk material to handle it will pay you to look up the Brownhoist. Our Catalog K shows different types of Brownhoists doing many kinds of work. We will send you a copy promptly for the asking.

BROWNHOIST

Products include:

Locomotive Cranes
Grab Buckets
Drag-line Buckets
Electric Hoists
Tramrails and Trolleys
Overhead Tr. Cranes
Pillar and Jib Cranes
Heavy Dock Machinery
Suspended Concrete Bins

Write for Catalogs

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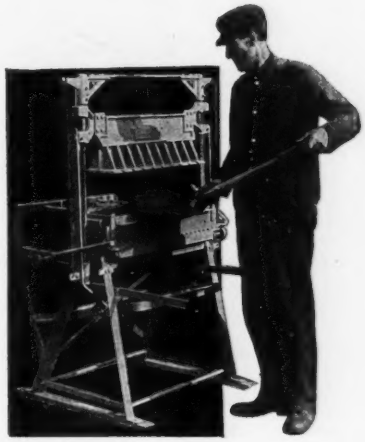

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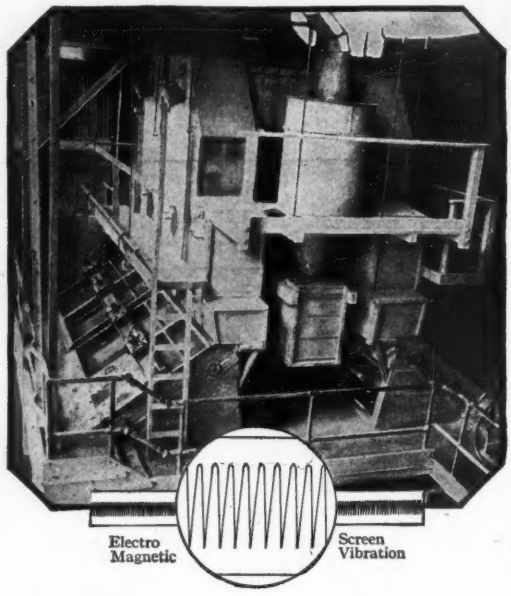

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Rock Products

Vol. XXIII Chicago, December 4, 1920 No. 25

Varied Operations at an Ohio Limestone Quarry Plant

Ohio Marble Company, Piqua, Ohio, Produces Fluxing Stone, Agricultural Limestone, Chicken Grit, Whiting and Other Important Products

THERE ARE NOT many plants in the country manufacturing so large and so varied an assortment of limestone products as the Ohio Marble Co., of Piqua, Ohio. This prosperous quarry company has recognized the value of the by-products of limestone and has fully equipped itself with modern machinery to take care of the growing demand for such products as agricultural limestone, chicken grit, pulverized limestone, etc.

The company has acquired a total of 285 acres of land in what were originally two adjoining quarry properties. The Ohio Marble Co. proper is one of the oldest established Ohio quarry industries and has largely worked out its quarry. In order to gain access to recently acquired quarry property adjoining it was necessary to cut a right-of-way 600 ft. long, 35 ft. high and 70 ft. wide through solid rock. It was also necessary to construct permanent bridges for a railway and a public highway, both of which are crossed by the quarry right of way. This work was all done by the company itself. The accompanying views show the cut as it now looks with the new concrete bridges.

Quarry Operation

The quarry being operated now has a face 32 ft. high and 4,000 ft. long. It is estimated that there is 500,000,000 tons of workable stone there. The deposit contains only 4 ft. of overburden which is removed by a steam shovel and dinkey and transferred to the old quarry. Here it is dumped and consequently a good portion of the old quarry has already been filled in. This quarry is right in the village and the company plans to erect houses for its employees on this made ground.

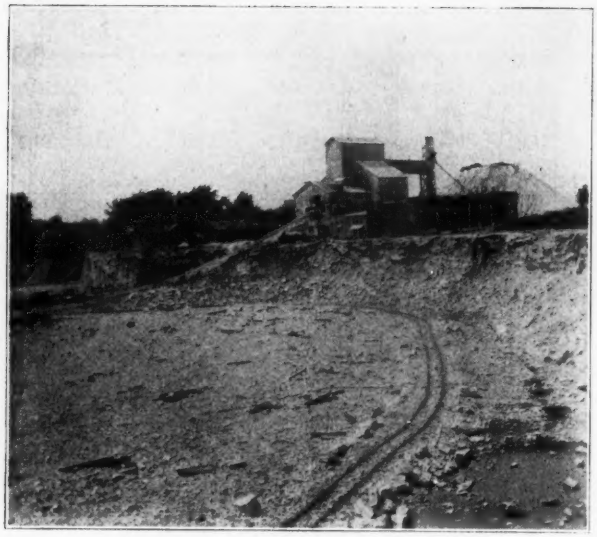
For blast holing three well drills, cutting a 4½-in. hole are used. Two of these are electrically driven and one has a gas engine drive. The holes are drilled about 2 ft. below the quarry floor and loaded with 40 and 50% dynamite, an average of 90 lbs. of dynamite being put in each hole. Blasts occur here quite frequently, because the nature of the stone is such that considerable pop-shooting is necessary, and this is more easily accomplished in connection with small shots than with large ones.

The shattered rock is loaded into cars by two steam shovels, railway type, both having 2½-cu. yd. dippers. The layout of the tracks is so arranged that cars can be taken to the shovels from either of two crushing plants. The shovel loads the stone into 3-yd. 36-in. gauge, end-dump cars, of steel construction and the haul to the plant is made by steam dinkeys, of from 12½ to 16-ton capacity. Each dinkey, of which there are five, hauls from 10 to 12 cars.

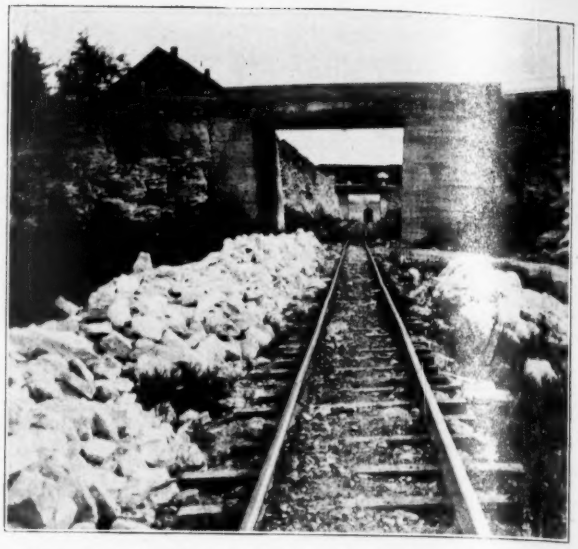
Description of Plant No. 2

The Ohio Marble Co. plant No. 2, to which is now being added an agricultural limestone plant, adjoining the fluxing and road stone plant, as shown in one of the accompanying views, is located about 500 ft. from the quarry face. The quarry cars described above are hauled up an incline

Quarry shovel, dinky and cars H. A. Johnson, superintendent Horizontal centrifugal drainage pump

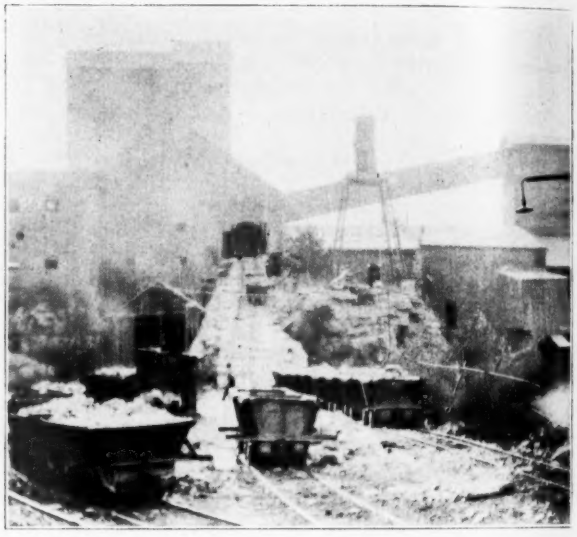


Plant No. 2, Ohio Marble Co.



Highway and railway bridge over track between two plants

Plant No. 1 of the Ohio Marble Co.



Incline at Plant No. 1

Abandoned quarry of Plant No. 1

Crusher and elevator for hand-picked stone

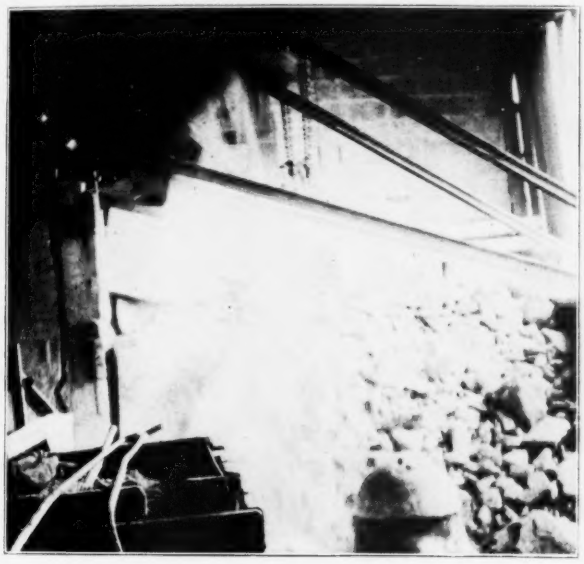
to a No. 7½ gyratory crusher located 35 ft. above the quarry level, by an electric friction hoist. The stone entering the crusher is reduced to an 8-in. size, and is then reclaimed by a 28-in. bucket elevator of 70-ft. centers, which deposits the crushed stone in a dust-jacketed sizing screen, 4 ft. in diameter, and 22 ft. long. This screen sizes all material from dust to 8-in., which after leaving the screen goes to bins according to size. The rejections from the screen are chuted to another bin, and are sold for fluxing stone.

The plant is so arranged that if a greater percentage of finer material is required, the rejections from the screen can be chuted to a No. 6 gyratory crusher. From here it is reclaimed by a 20-in. bucket elevator and deposited in a hopper feeding a gravity screen. The finished sizes from this screen are chuted over to the elevator serving the large crusher, mentioned before, and again deposited in the rotary screen for final sizing. The rejections from the gravity screen are chuted to a No. 3 gyratory crusher and the process is again repeated. The sized stone from dust to 8-in. is deposited in eight bins, 16 ft.x16 ft., each bin having a capacity of 150 tons. The dust is sold for agricultural limestone, while the rest is fluxing and road stone.

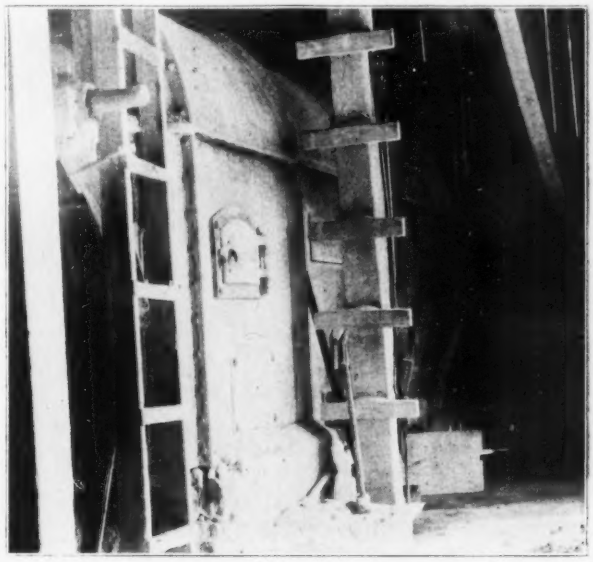
The new agricultural limestone plant now under construction, will have a storage capacity of 40 cars of the finished product. The top of the plant is being so constructed as to enable the company to install rescreening and pulverizing devices. The new plant is of reinforced concrete construction, and will have two track scales. This plant will be described in a later issue of Rock Products when completed.

Description of Older Plant No. 1

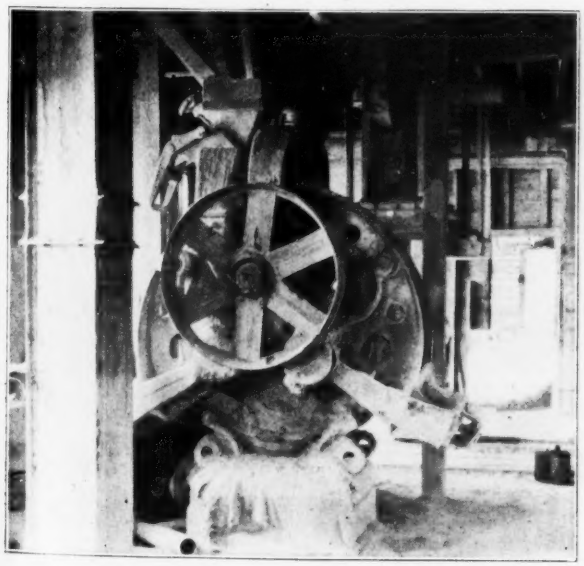
The original Ohio Marble Co. plant, now called Plant No. 1, which is located about a quarter of a mile from the present quarry face, is also a fluxing stone plant, besides manufacturing the numerous by-products of limestone. As in the case of Plant No. 2, the haul to the foot of the incline is made by a steam dinkey. During the haul and while the cars are waiting to be hoisted up the incline, the pure white crystalline rock is hand picked



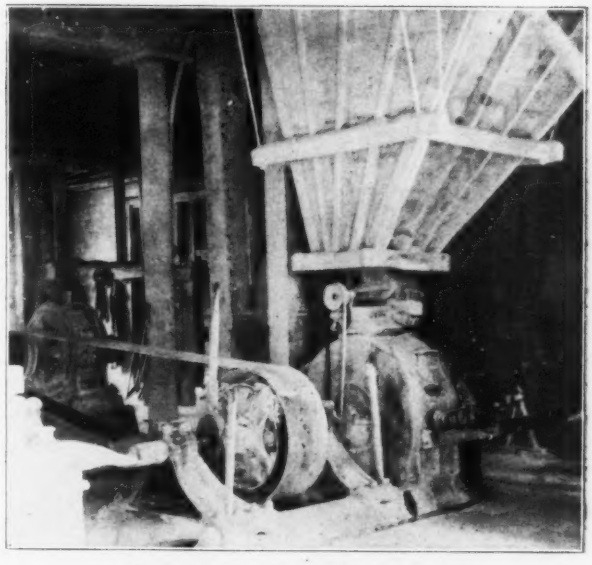
Dumping track and crusher



Coke-fired indirect heat dryer for stone



Maxecon grinding mill for agricultural stone



Limestone grinding mill and feeder

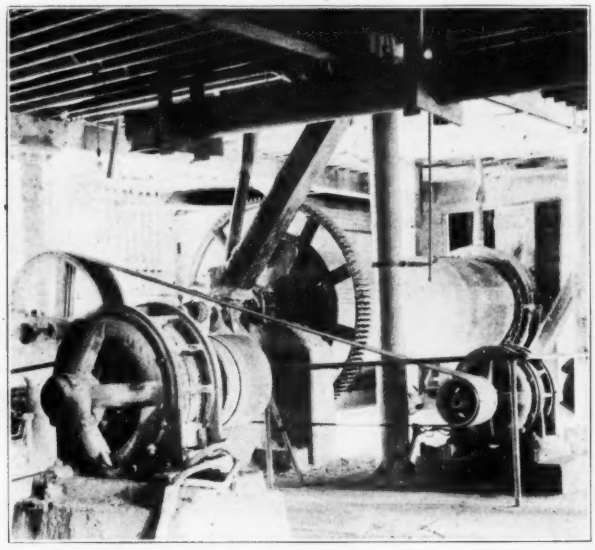
from the cars, and deposited alongside the track. This rock is used exclusively for the manufacture of chicken grit. It is afterwards reclaimed from these side-of-the-track dumps and taken to a crusher located on the quarry floor. This is shown by one of the accompanying views, which also shows bucket elevator used to reclaim the stone from the crusher and convey it to the recrushing screening and bagging plant.

The stone in the 3-cu. yd., end-dump cars is hauled up the incline by an electric friction hoist and dumped automatically into a No. 7½ gyratory crusher. This crusher reduces the stone to 8-in., after which it is reclaimed by a 28-in. bucket elevator of 80 ft. centers, and deposited in a rotary jacketed sizing screen, which separates all the stone from 1¼-in. to 8-in., the stone going into six separate bins of 150 tons capacity each. The stone from 1¼-in. to dust is chuted to a gravity screen, where two separations are made, 1¼-in. to ½-in., and ½-in. to dust, the material going into two bins, also of 150 tons capacity. This practically takes care of the entire fluxing stone operations at this plant.

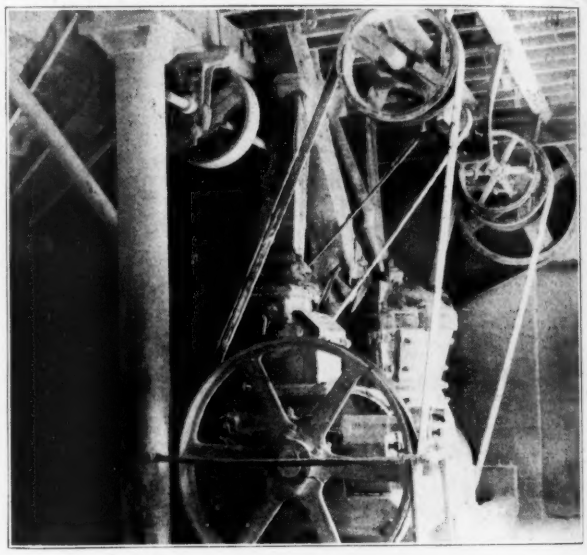
Grinding and Pulverizing

As mentioned before, the hand-picked pure white crystalline stone, when reclaimed, is thrown into a No. 5 gyratory crusher, which is located on the quarry floor. The reclaiming of the stone and the dumping into the crusher is entirely a hand operation, and one that requires experienced hands, too. When crushed, the stone is taken up by a 16-in. bucket elevator of 65 ft. centers, and deposited in a storage bin, of 1,400 tons capacity. The stone here is from 2½-in. down to dust.

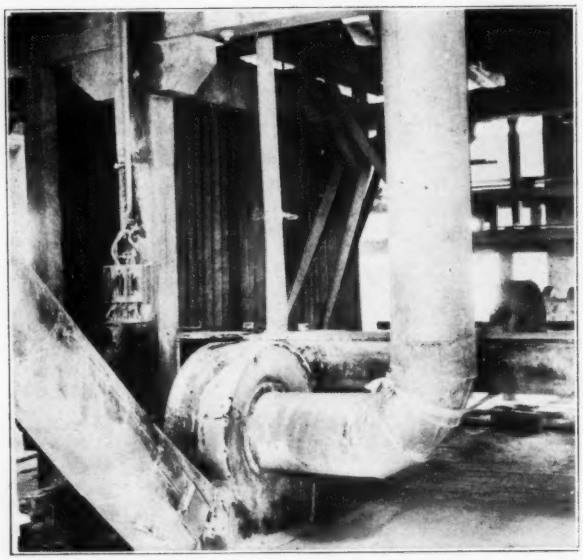
As the stone is needed, it is reclaimed from the storage bin by a small 8-in. bucket elevator of 10-ft. centers, which carries the material to the dryer. This dryer consists essentially of a long revolving steel shell, enclosed in a steel casing. The axis of the dryer is set at a slight inclination, and heat is furnished by coke, which is used for fuel. The steel casing is provided with three separate firing doors, while the inside of the revolving shell is fitted with a series of baffle plates, which constantly elevate the material and shower it through the hot furnace gases and against the hot shell, the material at the same



Ball tube-mill pulverizer



Sturtevant crushing rolls



Fan and connections for dust collection

Bag-type filter and dust collector

time being carried forward to the discharge end of the dryer, and discharged after it has been thoroughly dried.

After passage through the dryer, the material is reclaimed by a 10-in. enclosed bucket elevator of 40 ft. centers, which deposits it on a 14-in. belt conveyor, 40 ft. in length, discharging into a small Sturtevant gyratory crusher. It then goes by gravity to a set of 14-in. Sturtevant crushing rolls, and is reclaimed from these by 10-in. bucket elevator of 30 ft. centers, which in turn feeds a Jeffrey vibrating screen.

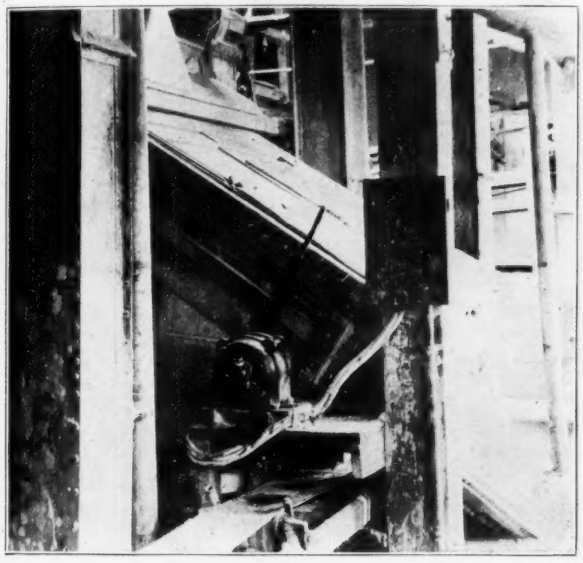
On leaving the screen the material falls on a 10-in. belt conveyor, 170 ft. in length, which carries the screened product to the storage bins in the bagging building. There are 16 bins in this building, each bin having a storage capacity of 100 tons, and the material goes from the bins to two bagging machines by gravity. Besides the two bagging machines, which are of the type commonly used in flour mills, the company also bags its products by means of chutes. This is accomplished by having the material from the storage bins go by gravity to a 9-in. screw conveyor, which carries it to a 10-in. bucket elevator of 25-ft. centers, which in turn deposits it in the packer hopper.

The above illustrates the manner in which the company prepares its agricultural limestone and chicken grit. Both of these products are prepared separately, viz., when agricultural limestone is being made, no chicken grit can be made. However, the same machinery is used for both, the only change being necessary is in the different sizes of screens.

Besides the rolls used now for finishing, the company has a Kent mill which was being installed at the time of the writer's visit. This mill is of the type where a vertical ring and three rolls are pressed against the inside surface by means of springs. In the Kent mill the rolls revolve about three fixed axes and drive the ring also, so that this revolves too.

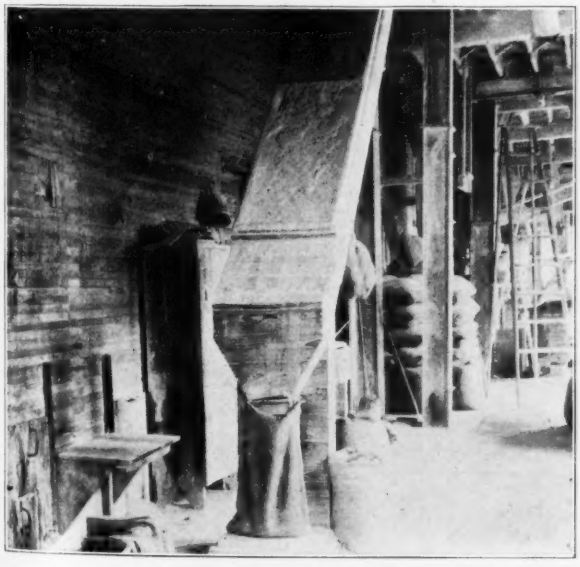
Preparation of Fine Limestone Dust or Whiting

For the manufacture of fine limestone dust, the material from the storage bins

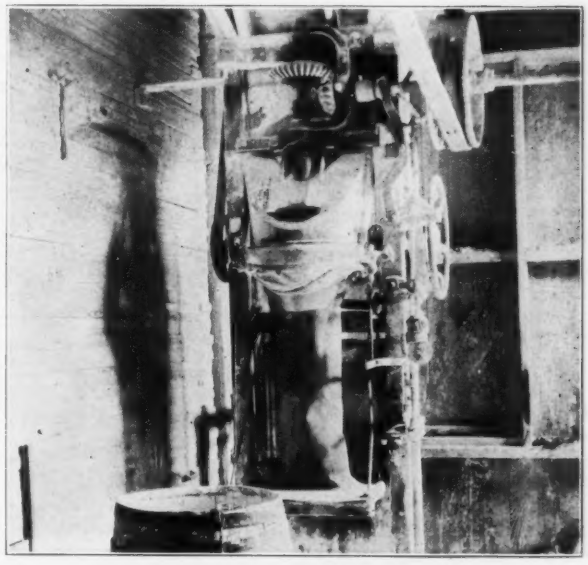


Jeffrey vibrating screen

General view of sacking room



Bagging chicken grit



One of the sacking machines used

is chuted by gravity to a Smith ball tube mill, where it is pulverized by the grinding action of steel balls of 1¼-in. diameter, with which the mill is filled, against the Belgian block lining of the steel shell. The steel shell is 4-ft. in diameter, and 16 ft. long, and its axis is set on a slight incline, so that the material discharges readily into a 10-in. enclosed bucket elevator of 25 ft. centers. This elevator discharges onto a 10-in. belt conveyor, carrying the material to a packer hopper.

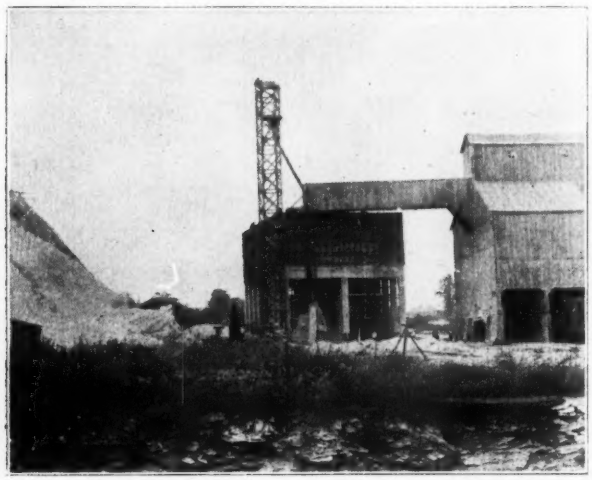
In connection with the manufacture of this limestone dust, agricultural limestone and chicken grit, a complete dust-collecting system is used. An exhaust fan operating through a system of pipes, which are placed at all advantageous points where the dust may be collected, collects the dust in a bag-type collector, shown in one of the accompanying views. The product collected is about 200-mesh and finer, and has a very extensive use.

Both the Ohio Marble Co. plants No. 1 and No. 2 are electrically operated throughout. The company receives the current in its transformer at 2,300 volts and reduces it to 440 volts.

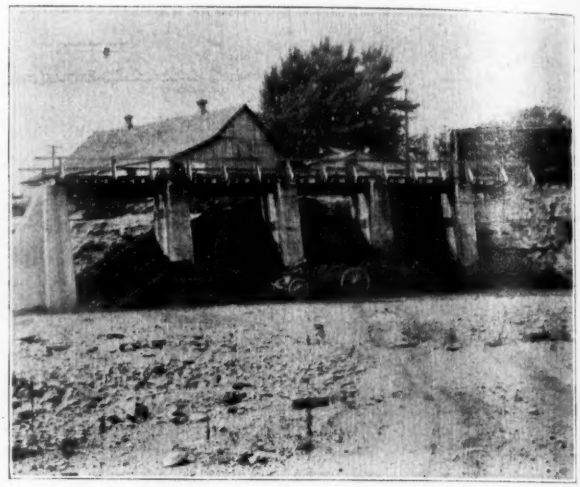
Changes in Quarry Operation

The company in its policy of improvement is planning some very radical changes in its quarry. It is their intention to install a jaw crusher in the quarry floor, and to install apparatus so that the entire fluxing stone loading would be done on the quarry floor. This will be accomplished by installing standard gauge equipment in the quarry, and laying out the grade from the crusher to the main track not to exceed ½ of 1 per cent. To facilitate this switches and locomotives will also be provided. The present 36-in. gauge equipment will not be destroyed, but will be kept in use to supply the agricultural limestone plants with the smaller sizes of stone.

The company is now constructing a modern machine shop and stock room, and will employ sufficient men in this capacity to not only handle their own work but also do jobbing on any outside work that may be brought in. Adjoining this building there will be a garage for fleet of motor trucks that the company maintains to make its own deliveries of road stone, concrete stone, etc.



New agricultural stone plant under construction



Concrete dumping trestle and coal stored in quarry

The company has at present, as can be seen in one of the views, a storage of about 300,000 tons of screenings, which are to be sold for agricultural limestone. This material is reclaimed from the dump piles, and the regular process of preparing agricultural limestone is gone through. In this way the company is well equipped to supply the seasonal demands for this product.

Personnel

The president of the Ohio Marble Co. is A. Acton Hall, who is a pioneer in the Ohio crushed-stone industry. He has been active in the operation of limestone plants for a great number of years, and has made his company one of the largest producers of both fluxing stone and agricultural limestone in the state.

Miss M. B. Miller is secretary of the company. C. L. Suessman is treasurer of the company, and H. A. Johnson is superintendent of both plants. Mr. Johnson, who has also been in the industry for some time, is one of the best versed men in the crushed stone industry in Ohio.

Carbon Dioxide and Plant Growth

WHEN LIMESTONE is "burned" to make lime, carbon dioxide gas is set free as smoke or gas and is wasted. Likewise when organic acids in the soil attack agricultural limestone carbon dioxide gas is given off. F. Bornemann, in a recent German agricultural paper, reviews a number of his experiments to support his conclusion that the size of crop yields depends primarily upon the production of carbon dioxide by the soil. The experiments included the artificial introduction of carbon dioxide gas into the soil and the stimulation of carbon dioxide production in soil by the use of manure. The results showed that large increases in leguminous crops were obtained by stimulation of carbon dioxide production in the soil. It is concluded that stable manure should always be used on leguminous crops, especially peas and beans.

Thus another fact regarding the fertilizer value of limestone is established. Not only is the calcium of the limestone a plant food, and the limestone itself a soil sweetener, but in the very act of sweetening the soil the other constituent of the limestone, the carbon dioxide, is made available as a fertilizer.

The results noted by the German experimenter also suggest that a way may some day be found to save the carbon dioxide which is now wasted at every lime plant, and to utilize it as a fertilizer. This might possibly be done by using some material like charcoal dust, or pulverized coke, that has the power to absorb large quantities of carbon dioxide (CO_2), which would afterward be slowly given off by the material when mixed with the soil.

Limestone Burned for Carbonic Acid Gas in 1918

THE 22,355 tons of stone, valued at $36,868, reported as being sold to carbonic-acid plants was quarried in California, Florida, Nevada, and New York. Near Los Angeles, Calif., at one carbonic-acid plant the lime remaining after the carbonic-acid gas is driven off is sold for the manufacture of hydrated lime.

Slate Shingle Industry of New York and Vermont

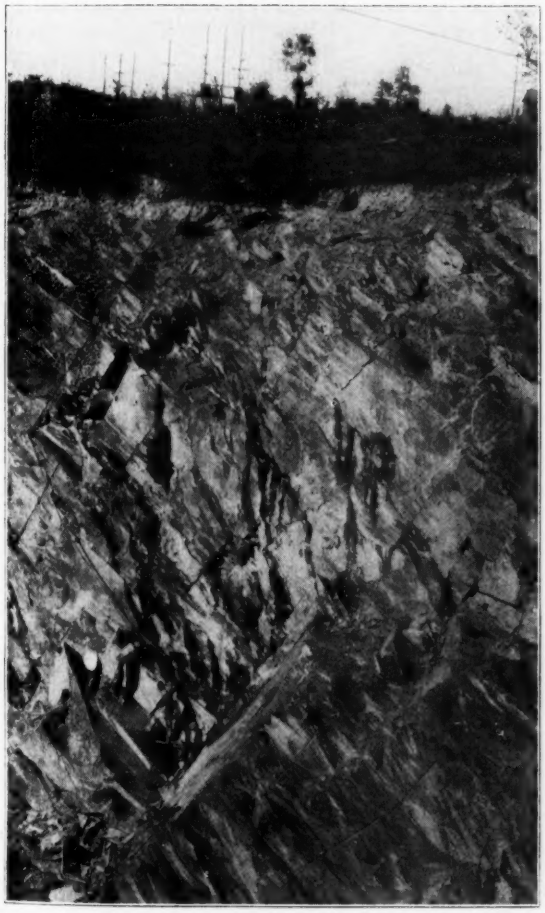
A Quarry Industry That Has Survived Because of a Meritorious Product Notwithstanding Many Handicaps—Brightening Future

SLATE SHINGLES at the quarries in New York and Vermont are made today just about the same as they were during the Colonial period. The industry is chiefly in the hands of many small quarry owners and operators, who employ from four to a score of helpers, get a living out of it themselves and permit a small and exclusive group of skilled workers to profit also. It requires but little capital to open a quarry and equip it in the approved manner. One can just about begin the production of shingles with a couple of quarry workmen and a splitter and his helper.

Apparently there is not much greater economy in a larger operation than a small one, under existing conditions. Hence there has been little incentive to large scale operations and few operators, big or little, have ever got far enough ahead of the game to indulge in adequate sales promotional work. Nevertheless the industry survives and from the cluster of slate quarries around the Vermont-New York state line between Rutland, Vt., and Granville, N. Y., roofing slates are regularly shipped to Texas, California and Hawaii.

No Question About Merit

The slate shingle industry has survived because the product has unquestioned merit. Slate shingles are fireproof, durable and capable of architectural effects possible with no other roofing material. Hence the industry has continued to exist because certain people of good sense have insisted on being fur-



Slate quarry showing angle of bedding of the stone

Quarry top showing method of handling the quarried stone

nished with slate shingles, rather than because the slate quarry men have ever indulged in extensive, up-to-date advertising and promotional propaganda.

The condition of the slate industry today is quite similar to a condition that the lime industry passed through not so long ago, and through which it has come with colors flying, largely through the efforts of its National Lime Association and the splendid *esprite de corps* that it has engendered in the lime industry. In both cases there is a product of ancient usage and of unquestioned merit, but operating conditions in both industries are such as to often discourage co-operation among producers with the resulting lack of business initiative and breadth of view so much needed in present-day commercial activities.

A Similar Case to Lime Industry

The lime industry was faced with competition of new materials promoted by modern methods. Men in the industry began to get cold feet and so lost confidence that they really began to believe themselves that lime was being overproduced and bent their efforts, in some cases, more to discouraging newcomers into the industry than to developing the tremendous potential demand that lay just under their noses. Every reader of Rock Products knows how different is the situation today. Now no man is ashamed to acknowledge himself a lime manufacturer and the lime industry is prospering as never before.

Something like that condition faces the slate shingle industry. Tremendous demands have been built up for various patent roofings—*fire-resistant roofings*—to replace wooden shingles which are getting scarce and high in price. Modern building material manufacturers saw their opportunity but the slate-shingle industry slept on. That is it did until quite recently.

Some of the progressive slate producers of the Granville, N. Y., district have recently perfected the organization of the American Sea Green Slate Co., a holding, selling and promotional organization with headquarters at Granville, which possibly marks the beginning of a new era in the slate industry. This company is practically an association of ten or a dozen producers of sea green roofing slate, of which Frank S. Fogg is manager and secretary.

New Efforts to be Made

This association, under one name or another, has been in existence for some time and under Mr. Fogg's managership has done considerable promotional work with a very limited capital, but plans are making to extend these efforts on a larger scale and with greater working funds.

The work of this association, however, does not solve the problem of the slate-shingle industry because it comprises only a relatively small group of slate manufacturers. Besides the "sea green" slate there is in this same locality red slate, "evergreen" slate, purple slate and many shades in between. In Pennsylvania are black slates, and in Georgia various colored slates. The slate manufacturers of each locality insist on the superior virtues of their particular slate and as yet show no disposition to get together to promote *slate* as *slate*.

Again we have a similar situation to that once pertaining in the lime industry, which was the conflict of interests between the "high-calcium fellers" and the "low-calcium fellers." But even this difference seems to have been ironed out satisfactorily in the lime industry so there is hope for the slate industry.

Making Slate Shingles

The views herewith show a typical slate operation in the Granville district. The slate is usually quite near the surface of the ground, often outcropping so that the expense of opening a quarry

Harry Hix and Frank S. Fogg, two of the leading lights in the Granville, N. Y., slate-shingle industry

is not so very great. The bedding plane of the deposit, the direction in which the slate splits, is, as the views show, approximately 45 degrees from the horizontal.

Small hand-hammer compressed-air drills are used and shallow holes are made. Black powder is used for blasting and irregular shaped chunks or boulders are broken off. These are loaded by hand into skips and elevated and conveyed either to a waste pile or to the splitting shanties by aerial cableways. The cableway carriage seems to be peculiar to this section of the country, where it is used in limestone quarries as well. It dumps automatically. A description of it is given in the "New Machinery and Equipment" page of this issue.

The small stuff and imperfect blocks of slate are dumped directly on a waste pile and forgotten. The locality of the quarries is conspicuous for miles around because of these huge dumps—often on valuable quarry property. The disposal of this waste slate is one of the big problems of the industry and will be discussed in a later issue.

The blocks or slabs of slate suitable for splitting into shingles are conveyed to shanties or work sheds where they are drilled with hand-hammer compressed-air drills and split with a bull wedge and feathers to an approximate size to make one or the other of a large variety of shingles.

The splitting is done by hand with a mallet and wedge, or chisel, as one of the views shows. The slab of slate is simply split in half each time and the process continued until the approximate thickness required is attained. The splitter then lays the rough-edged pieces of slate aside and a helper trims these slabs into the largest shingle (according to certain standard dimensions) that the piece will make. The trimmer is a simple shearing machine, generally operated with a foot treadle.

The finished slate are then laid on shelves according to their size. They may or may not be drilled or punched with holes for the nails. From the shanty they have to be handled by some means to a stock pile or shipping warehouse. This is usually done by the crudest of methods—horses and wagons. In loading cars for shipment the shingles again have to be handled; practically speaking, each individual one separately.

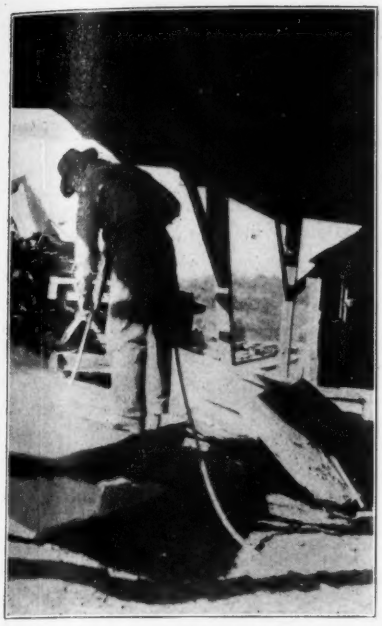
Obviously there is altogether too much handling and labor attached to a product of such low initial value and here is a field worthy of investigation by business and technical experts. It ought to be possible to devise mechanical methods to do much of this handling. The problem is certainly no more difficult than has been met and solved in a host of other industries.

Labor Problem

The workmen are mostly Welch. They are strongly unionized. They work for day wages and not on the piece-work system. They have an apprentice system which limits the number of splitters to what they consider the industry can take care of, and needless to say they have not quite as liberal a view of that as the quarry owners, which generally speaking is not saying much.

As an example of the tightness of their hold on the industry one incident is significant. They have always preserved the Welch custom of eating a second breakfast in the middle of the forenoon. They have had a strike over their right to knock off work in the forenoon to eat this breakfast and they have won out.

From the foregoing it can be seen that there are some big obstacles in the way of putting the slate shingle industry on a business-like basis. But the opportunity is certainly there and it is recognized by many progressive slate quarrymen. Individually they can do little; collectively



Drilling slab for bull-wedge split

Driving home the bull wedge to get proper dimension slabs

they have an almost unlimited field both in the improvement of quarrying and manufacturing methods and in the merchandizing of their product.

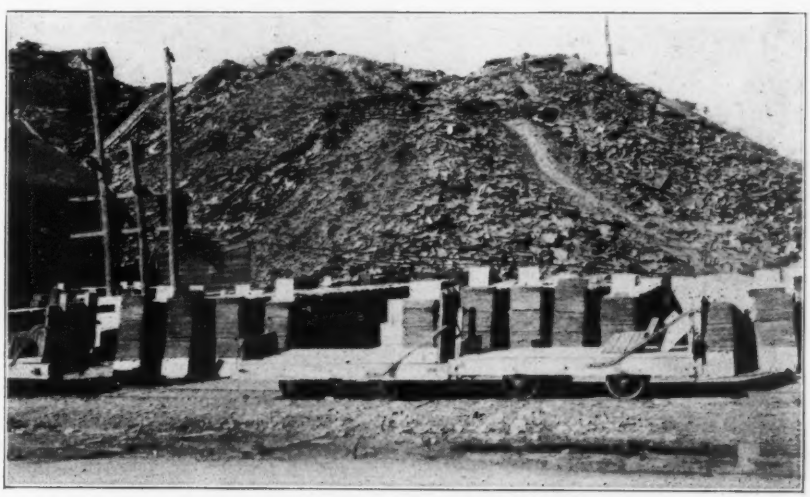
Grain in Slate*

SLATES BREAK MORE readily in one than in the other of the two planes perpendicular to the cleavage. This direction of easy breakage is called the "grain," and usually shows itself in more or less obscure striations of the cleavage surfaces in a direction nearly parallel to the cleavage dip. The grain is utilized in breaking down large blocks of slate to workable proportions, and roofing slates are always cut with their long sides parallel to the grain. The ease of fracture along the grain varies greatly in slates from different quarries, and some show scarcely any grain.

Grain may apparently be due to two causes. Most commonly it is developed contemporaneously with the cleavage and perpendicular to the direction of intermediate pressure (the intermediate axis of the strain ellipsoid.) It may also be produced by slight secondary pressure, in which case it is related to false cleavage. In the first case the mineral particles, which have their flat surfaces perpendicular to the direction of greatest pressure, have developed with their longest axis in the direction of least pressure. Naturally, the direction of easiest relief of pressure is upward, so the longest axes of the crystals, which determine the grain, are about parallel to the cleavage dip. Crystals of this sort are prominent in some of the green slates found in Georgia.

*Bulletin 34, Geological Survey of Georgia.

Splitter at his work of making slate shingles



Piles of finished slate ready for shipment. Note huge pile of waste slate in background

Hints and Helps for Superintendents

Economy in Well-Drill and Steam-Shovel Quarry Operation

BY TOM SHIRAS, MOUNTAIN HOME, ARK.

IN ORDER to overcome labor shortage with which it has been bothered for the last three years, the Arkansas Lime Company of Ruddells, Ark., one of the largest concerns of its kind in the state, has abandoned its former methods of breaking and moving rock in the quarry and has installed new machinery and new methods which are showing a big saving in the cost of operation.

"Do it by machinery," that was Geo. Weigart's advice, when men began to get scarce, and they are doing it that way now. Mr. Weigart is the general manager of the concern.

For two years they had not seen the floor of their quarry, owing to the constant slipping of their overburden and the waste. They could never get men enough at one time to clean it up and keep their three big kilns supplied with stone.

A steam shovel cleaned the floor up in three weeks and kept the kilns going at the same time, offsetting the labor of 25 men and making a clean saving of $50 a day.

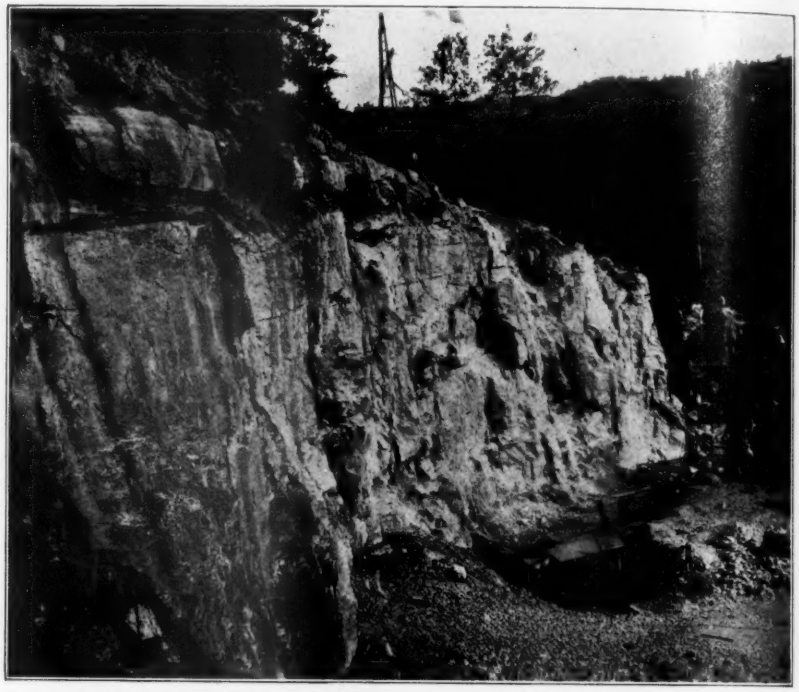
For years the company has done its breaking with jack hammers and tripod air drills driven by a big compressor. When labor tightened up it became almost an impossibility to get experienced men to operate the drills, and rock was broken slowly. This condition existed until September, when the let contracts for 1600 ft. of drilling to be done with a regular quarry well drill.

This quarry is 85 ft. high and 250 ft. wide. The well drill is at work on 19 holes which will be drilled to a depth of 75 ft. each. The holes are being spudded in approximately 15 ft. behind the face and strung along the full length of the quarry.

The first round of four holes is at the south end of the quarry and will be completed sometime late in November when they will be shot. It is estimated that 1200 lbs. of dynamite will be used in the loading and that the shot will bring down 10,000 tons of stone. As soon as these holes are drilled in and shot work will start on fifteen more which will be shot in the spring. They expect to get 36,000 tons of rock with this second round.

Mr. Weigart states that after these holes are broken in the spring that he expects to have enough stone on the floor to keep his kilns in operation three years.

The compressed air drill equipment now on hand will not be entirely discarded as it will be necessary to use it in breaking boulders.



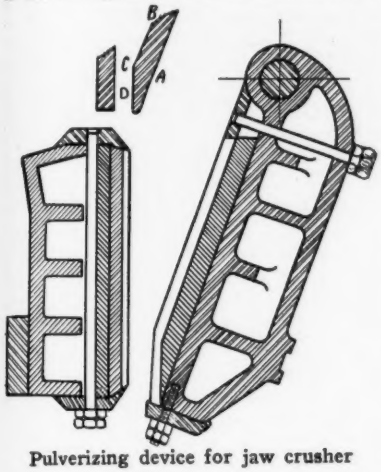
Quarry of the Arkansas Lime Co., Ruddells, Ark., showing 85-ft. face

Steam shovel cleaning up quarry floor preparatory for blasts which are expected to bring down 50,000 tons of stone

Pulverizing Jaw Plate for Jaw Crusher

VERY OFTEN it is impossible to adjust an ordinary jaw crusher to give a good percentage of fines. The device pictured below shows how a swing jaw plate can be designed so as to give a good percentage of fines.

Taking as a basis a 30x15-jaw crusher, in order to get a good percentage of fines, a swing jaw plate with a beveled smooth face can be made. The size from *A* to *C* is about 5-in., and from *B* to *C* is the corrugation as in the standard jaw



Pulverizing device for jaw crusher

crusher. The smooth beveled face is about 6-in. at the lower end. The opening of the jaw crusher is made to conform to the size of fines required. For instance if a ¾-in. stone is required then the opening at *D* is ¾-in.

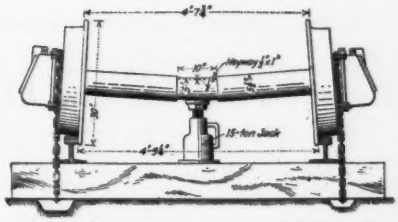
In operation it is obvious that the rock to be crushed will receive several blows before it finally rejected for passage to the screen.

The arrangement of the jaw plate eliminates the twist in the swing jaw as a toggle between the swing jaw and the pitman can be used as in the ordinary crusher. This device was suggested by a practical operator.

Bent Axle of Railroad Steam Shovel Straightened in Place

A BENT AXLE of a railroad steam shovel was straightened by a railroad yard crew in the field without removing the axle from the truck. Less labor was expended on the job than probably would have been necessary in putting in a new part and the cost was under $50. The shovel was a Marion type 1778, the property of the Vang Construction Co., and the work was done in the car yards of the Western Maryland R. R. near Cumberland.

The truck was run out from under the shovel, the axle spotted over a tie with



Bent steam-shovel axle straightened

the bend of the axle down. Holes were excavated under the tie beneath the journal boxes and the axle securely lashed to the tie with a 1-in. car chain passed over the journal boxes close to the wheel. The axle is 5½ in. in diameter except for a 10-in. length in the center which was turned down to 5 in. with a ½ in. by 1-in. key way cut into it. All the bend was in this portion and was sufficient to make a 1½-in. difference in the gauge of the wheel, as shown by the cut. The cut also shows a general arrangement of the work, together with various dimensions.

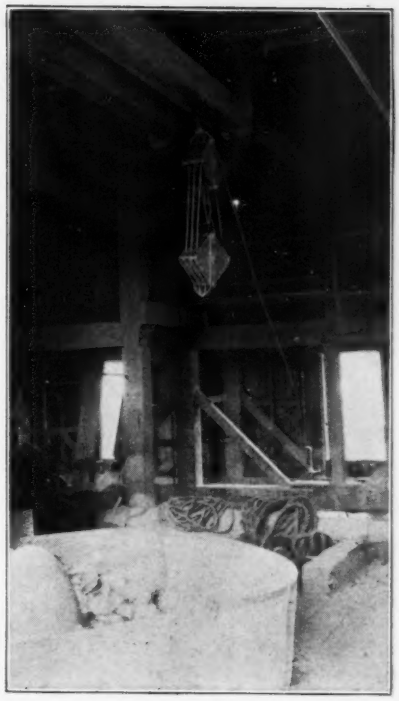
The bent portion was heated to an almost white heat with a crude oil burner, a boxing of sheet iron and wood having been built around the bent portion to confine the heat. A 15-ton jack was then placed under the axle by means of which the bend was straightened. It was a compound bend, two applications of the jack being necessary, but only one heating being required.

The work was started at 2:30 p. m., the heat applied at 3:45 p. m., the pressure from the jack applied about 4:15 p. m., and the cooling started at 4:35 p. m. The truck was in place under the shovel at 5:30 p. m. Water was used to hasten the cooling and to temper the axle.—Morgan Cilley in the "Engineering News-Record."

Traveler for Hoist in Crushing Plant

IT IS HARDLY NECESSARY to enlarge on the advantages to be gained by having a crushing plant fully equipped with cranes and travelers for handling machinery parts. The use of overhead travelers is practically indispensable in a well equipped crushing plant. Their cost is very small compared with the great saving of time in moving parts when setting up or repairing the crusher. Substitutes for these appliances may be undoubtedly made to serve the purpose, but no arrangement embodying an equal degree of safety and efficiency can be had at less expense. The accompanying illustration is a typical instance of the need of some method of handling crusher parts.

Unfortunately many existing crushing plants are not very well equipped in this respect, but providing there is sufficient



Beams supported by hangers for carrying traveling hoist

headroom it is not difficult to add such equipment. The illustration herewith shows how provision was made for a traveler in a plant of timber construction.

The traveler track is supported on a pair of large timbers hung from the floor-beams overhead by cast-steel hangers. Of course care must be taken to properly reinforce the floor-beams over head to carry the extra load; this could be done with steel truss rods if necessary.

Typical example of why travelers should be provided

Pump and Water Piping for Sand Gravel Washing Plants

Water Supply; Size of Pump and Piping Required; Sprinkler Heads

By James N. Hatch
Consulting Engineer, Old Colony Bldg., Chicago, Ill.

THE WATER SUPPLY for a gravel screening and washing plant, while it may possibly be considered one of the minor divisions of the equipment, is one that should be carefully worked out. For any mistake in this part of the equipment will mean a serious handicap in the proper operation of the plant.

The first stipulation in regard to water supply would perhaps be to have it ample. An excess of water can easily be remedied, but a lack is always a handicap. It is desirable to have considerably more water than simply that required to clean the gravel, for even if the gravel and sand were clean it would still be found desirable to have a spray of water on each screen to aid in the screening and separation. Merely damp sand and gravel are not easy to screen. The material should be either thoroughly wet or absolutely dry.

To determine just exactly how much water is required for any given case will depend on the material to be handled, but a rough preliminary determination can be reached by providing the same number of gallons of water per minute as there will be yards of material per ten hour day handled through the screens. This is approximately true for an average condition and good judgment based on experience will guide the designer in a further study for an actual case.

Water Supply

There should be an ample supply of water provided from some unfailing source. If the gravel is in a bed under water, it is often possible to put well points down in the gravel, directly beneath the pump and obtain all necessary water from these well points. This of course can only be determined by a study of the individual conditions applying in each case.

Size of Pump and Piping Required

In most sand and gravel washing plants a centrifugal pump is used, located on the ground level near the screening plant. The water is pumped up to the top of the plant and delivered at the highest point under a low pressure.

In determining the size of pump required the volume of water per minute must first be determined. This amount of water must then be lifted from the water level in the ground and forced to the top of the receiving hopper. In determining the power required to accomplish this, the friction head must be considered, due to the length of pipe and the bends plus the pressure head required at the highest nozzle.

This friction head and pressure head will depend on the size of and amount of pipe used. So it is necessary to make some assumption, as to the size and layout of piping that will be used and then, knowing the volume of water required, the size of pump can be figured.

Several assumptions may be necessary in order to arrive at the most economical installation. The larger the pipe the more it will cost. If the size of the pipe is reduced it will require more power in the pump to force the required amount of water through it, and therefore a more expensive pump. At some point of adjustment the most economical sizes for both pump and pipe can be arrived at.

As an example suppose it is desired to design the pump and piping for a plant to handle 1,000 yds. of material in ten hours. For average material, this will require the delivery of 1,000 gallons per minute at the discharge point from the receiving hopper which we will assume is 75 ft. above the ground. Also assume that the level of the water from which the suction is taken is 15 ft. below the ground. The total lift will then be 90 ft. As a first assumption let us say the friction head will be equivalent to 15 ft. and that the necessary pressure head will be 10 ft. more. The pump would then have a total head of 115 ft. to pump against, in delivering 1,000 gallons per minute.

Suppose the velocity through the pipe is 10 ft. per second, then the size of the pipe would be found by the following formula, remembering that one gallon of water equals 231 cu. in.

Cross section area of pipe in sq. in.

$$= \frac{231 \times 1000}{12 \times 10 \times 60} = 32 \text{ sq. in.}$$

Then the diameter = 6.5 inches.

This would indicate that a 7-in. pipe would be necessary, but as 7-in. is an odd size an 8-in. pipe would be selected.

It would probably be best to use a 10-in. suction and an 8-in. discharge. With this data the pump requirements can be determined. When the cost of the pump and piping has been determined it may be found that a different arrangement would make a less expensive installation. That is, it might be found that the velocity could be either increased or diminished from that assumed. This would change the diameter of pipe and change the friction head accordingly and change the size or the "r.p.m." (velocity) of the pump correspondingly.

A small priming pump should be installed which will start up with the motor and prime the centrifugal pump and then automatically cut out after the large pump is in operation.

Pipe of the size determined will be carried to the point, where branches are taken off. Then of course the size of the main will be reduced accordingly.

A branch line should be led along the revolving screens with a sprinkler head in each screen. There should also be a branch with sprinkler head at the outlet of the receiving hopper, drenching the material as it falls from the hopper.

Sprinkler Heads

Various kinds of sprinkler heads are in use. A common practice is to simply flatten out the end of the pipe leaving a narrow slitlike opening. Another is to screw a cap on the end of the pipe and saw a cut through this cap.

Starting Switch

A starting switch should be provided in a convenient place for starting and stopping the pump motor. It is sometimes found most convenient to locate this starter up on top of the structure so that the pump can be started by the operator, who operates the revolving screens. At other plants it is felt that the best place to locate this starter is in the pump house beside the pump. This is a matter of detail to be decided for each particular case.

The pumping equipment should be housed in a convenient house, which will protect it from the weather, and should be located in such a position that a minimum of piping will be required.

Remodeling a 1000-Ton Per Day Crushed Gravel Plant

Consumer's Rock and Gravel Co. of Los Angeles, Calif., Takes Over and Operates Tejunga Rock Co. Plant

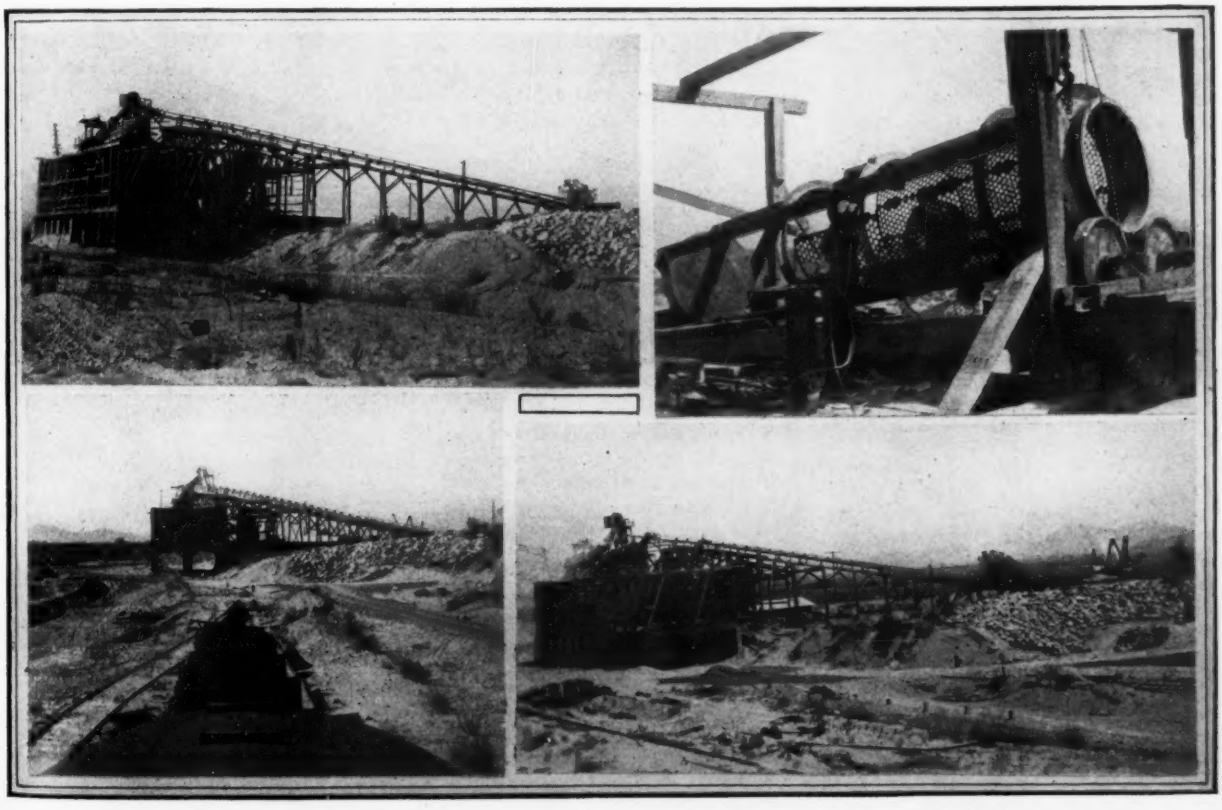
By George Gautier

DURING THE PAST SUMMER the crushed rock plant built by the Tejunga Rock Co., fourteen miles north of Los Angeles, began operations after a period of idleness dating from 1916. This plant was originally built in 1906 at an initial cost of nearly $100,000. During the ten years following its completion another $100,000 was spent in remodeling. In 1916, the plant representing an outlay of practically $200,000 was shut down because rock and gravel did not command a price sufficient to cover the freight rates to Los Angeles. Then, too, the plant was a complex tangle of machinery which was expensive to operate. It was one of those plants unsuited for its location and character of work because it was designed and built before a thorough understanding of conditions and requirements was had by the operators.

During the spring of 1920, the Consumer's Rock & Gravel Co., of Los Angeles, purchased the plant and at once began putting it in shape to run. The plant has been entirely remodeled and the method of operation has been radically changed. The remodeled plant as it stands today is as simple in its operation as it was previously involved. For instance, a battery of five continuous chain buckets was used to elevate the aggregate to the top of the bunkers. There was a separate elevator system for two grades of sand and for each grade of rock. Any operator who has had any experience with chain buckets knows what difficulties five units mean. The plant as remodeled is served by a single bucket elevator. A 30-in. conveyor belt has displaced four of the old continuous chain buckets. In addition, wearing parts have been reduced to a minimum. Chains and sprockets have been entirely eliminated. In every instance drives are direct and by belt.

The plant is situated on a picturesque 1200-acre site which lies on the broad levels of the Big Tejunga wash, near the eastern shore of the San Fernando Valley. The aggregate is a mixture of white sand and granite boulders, running about 45% in rock and 65% in sand. The wash is noticeably free from large boulders which occasion more or less trouble at the big rock plants in the San Gabriel valley. In fact, perhaps 75% of the rock does not reach over 8-in. in diameter. This, of course, simplifies matters very much as the crushers are able to handle practically all the rock.

The material is excavated from the wash by a locomotive steam shovel



Various views of the remodeled plant of the Tejunga Rock Co., Los Angeles, Calif.

equipped with a 2-yd. dipper bucket. The shovel loads a 20-yd. field hopper from which a string of 5-yd. cars are loaded. The loaded cars are run on a standard gauge track to a hopper located 200 ft. from the bunkers. An automatic feeder at this hopper feeds the 30-in. conveyor belt continuously and regularly. The conveyor belt conveys the aggregate to the top of the bunkers and discharges it into a huge 20-ft. cylindrical screen. This screen turns out fine and coarse sand and three grades of rock; viz., ¾-in. and 1½-in. pebbles. Oversize falls through a chute to a No. 5 gyratory crusher, which crushes the rock down to 3-in.. The rock after leaving this crusher drops to a conveyor belt which carries it to a 36-in. disc crusher. From this crusher the rock is discharged into a chain bucket elevator which elevates it to the top of the bunkers and discharges it into a 16-ft. cylindrical screen. The screen turns out rock screenings, ¼-in., ¾-in., 1½-in. and 2-in. crushed rock.

Motor Trucks and Trailers for Transportation

Facilities have been provided for loading both cars and trucks. Although the plant is situated about fourteen miles from Los Angeles, the management plans making the bulk of its deliveries into the city by motor trucks. It is planned to equip 10 Packards and Pierce-Arrows with two 5-ton trailers each. As there is a continuous and unbroken grade into Los Angeles, it is expected that deliveries will be made quickly and economically, especially into the Hollywood district which is but ten miles from the plant.

Electric power is used exclusively throughout the plant with the exception, of course, of the steam shovel and the locomotive which draws the cars to the hopper. There are individual drives for the crushers, screens, elevators and buckets. Fifteen thousand volts are received at the transformers and reduced to 220. Incidental work done about the plant includes the building of two miles of road for trucks, the laying of 12,000 ft. of standard gauge track and the erection of several cottages for employees and their families, and full and complete installation of safety devices. The capacity of the plant at present is 1000 tons a day, but it is expected to run more than 1500 daily as soon as machinery recently ordered from the East is installed.

Properties of Silica Suitable for Silica Brick

Limiting Amounts and Character of Impurities Affecting Silica Used in the Manufacture of Refractories

By Donald W. Ross, Washington, Penn.

PRACTICALLY ALL SILICA BRICK manufactured in the United States are derived from quartzites. Probably ninety (90) per cent. of this total supply comes from the Medina (Tuscarora) formation of central Pennsylvania, the Baraboo formation of Wisconsin, and the Weisner formation of Alabama.

The best silica rock usually contains from 96 to 98 per cent. of SiO_2, the balance being largely alumina, lime, iron and the alkalies. The iron frequently occurs as thin layers of hydroxide on the surfaces of the original rounded quartz grains. Possibly others of these impurities are similarly distributed.

One chief essential of a silica brick is that it be physically strong after being fired (say a modulus of rupture of 500 pounds per square inch). Satisfactory strength is usually accompanied by sound structure. If a brick has a good ring when struck it is apt to have good strength. Many varieties of silica material have not thus far been manufactured into satisfactory silica brick, the trouble being that the brick are weak and friable after being fired. This trouble may occur with quartzites, chert or massive quartz materials.

Possibly the cause of this behavior is that on account of the presence or peculiar distribution of certain fluxes (as is probably the case with some quartzites), or of a peculiar crystalline structure (as is possibly the case with some chert materials) the silica during heating is transformed very rapidly from high to low specific gravity forms. The accompanying rapid increase in volume supposedly causes myriads of tiny ruptures throughout the brick, thus destroying the bond. While on the other hand satisfactory quartzites are of such a nature that these transformers proceed more slowly, with the result that ruptures are but little formed, and the silicate glass, resulting from the interaction of the fluxes and silica, has a chance to bind the material firmly together.

THIS ARTICLE was prepared especially for Rock Products by one of the foremost experts on refractory brick in America. Mr. Ross is connected with a prominent manufacturer of silica brick and his article summarizes about all that is known about the properties of silica desirable for the manufacture of refractories. It is obvious that many practically pure silica deposits are not suitable for this purpose.—Editor.

In the case of quartzites this friableness is frequently avoided if the percentage of fluxes is low. This applies particularly to alumina. If the alumina and alkalies are low it is quite probable that an iron content of two (2) per cent. may cause no trouble. But if the alumina content of a quartzite be two (2) per cent. the resultant brick is very apt to be weak and friable. What has been said of alumina is probably also true of the alkalies.

McDowell* gives 0.5 per cent as the limit for alkalies. Too great a percentage of lime in a quartzite, in addition to the two (2) per cent of lime (CaO) used as binder, may also be expected to have a weakening effect on the fired brick. It is probable that quartzites containing less than 1.75 per cent. of basic fluxes will prove unsatisfactory. This is supposedly due to lack of bond.

*Bull. 119, Am. Inst. Min. Eng., Page 2011: 1916.

Elsewhere in this issue is a report by the United States Geological Survey on the effect of high calcium lime for refractory brick.

New British Cement Specification

THE British standard specification for portland cement which was first issued in 1904 has been recently revised. The new edition, just issued, supersedes that published in 1915. In the revised specification no cement to which slag has been added or which is a mixture of portland cement and slag will comply with the specification. The specific gravity test and the aeration of cement before testing for setting time have both been eliminated. Other modifications refer to the sampling of cement stored in deep bins, the calculation of the lime ratio, setting times, and the supplying of certificate by the seller. The specification can be obtained from the British Engineering Standards Association, 28 Victoria St., London, S. W. 1.

Rotary Kilns for Burning Lime*

Advantages—Size of Stone Burned—Fuels Available for Operating the Kiln—Costs of Operation

By Richard K. Meade
Consulting Chemical Engineer,
11 E. Fayette St., Baltimore, Md.

THE ROTARY KILN as used for burning lime does not differ in any particular from that used in the cement industry. It consists of an inclined cylinder from 6 to 8 ft. in diameter and from 60 to 125 ft. long. This cylinder is lined with fire brick and is supported on two or more steel tires which revolve on rollers. Power is received by means of a girt gear and supplied by a train of gears. The cylinder is slightly inclined from the horizontal, usually from ½ to ¾-in. to the foot. The limestone is fed in at the upper end of the kiln and a jet of burning fuel is introduced at the lower end. The limestone works its way through as the kiln revolves and is burned by the hot gases, falling out at the lower end of the kiln as lime.

The accompanying illustration shows a typical rotary kiln lime plant. The stone is held in a large bin and is fed from this automatically and continuously into the kiln. The latter is heated in this case by producer gas. The lime falls out of the kiln into a rotary cooler which reduces its temperature to the point where it can be conveniently handled.

Advantages of the Rotary Kiln

The advantages of the rotary kiln begin with the quarry. With the shaft kiln, whether of the most improved type or not, it is necessary to feed the kiln with stone of a certain size. If the stone is too big, the heat cannot penetrate to the center of the lump and consequently there will be a core or center of unburned limestone. If the stone is too small, the small pieces will work their way into the crevices between the larger stone and will choke the draft, not only decreasing very materially the output of the kiln, but causing irregular burning of the stone.

As a general rule, the stone for the shaft kiln should be brought down to a size ranging between 2 and 8-in. Where the stone breaks up in the form of slabs, these latter can be quite long provided their least dimension is not greater than 8-in.

The necessity of having the stone of this size increases very materially, not only the labor, but also the waste in the quarry. Where the small stone or spalls can be sent to a crushing plant or other use can be found for them, the item of waste is not great, but where they must be thrown away, the loss from this source is considerable. Quite a number of lime manufacturers have installed rotary kilns in connection with their shaft kilns for the express purpose of burning these small stones.

The saving of labor in the quarry is very considerable. The sledging of the stone to proper size and the hand sorting and forking add much to the cost of the stone. Of course where lime operations are large enough to justify the outlay large crushers followed by screens may be used to crush and size stone for shaft kilns. In order to justify this, however, quarry and crushing operations must be large, whereas with the rotary kiln the crushing unit can be made to match the output desired.

There are numerous limestones which do not burn satisfactorily in a shaft kiln owing to the fact that when the heat strikes them they fall into small pieces. In some cases. this action is very marked, the stone being almost reduced to dust. A very good example of this is the highly crystalline limestone found in the neighborhood of Franklin Furnace, N. J., some of the purest ledges of which have never been successfully burned in a shaft kiln due to this very reason. Another limestone which is difficult to burn is a shaft kiln, but which can be burned in a rotary kiln is the soft chalky limestone found in central Florida.

Size of Stone

The earlier rotary kiln plants nearly all reduced their stone to quite fine material—passing the 1-in. screen or about ¾-in. and under. In the writer's opinion this is unnecessary and good results are now being obtained with stone crushed to pass a 2-in. screen. This has the advantage of saving power and simplifying the outfit required.

The power required to crush the limestone may be safely figured at about 1¼ h.p.-hours per ton of limestone crushed which is equivalent to 2½ h.p.-hours per ton of lime produced (1.87 k.w.h.)

In small plants which would naturally employ hand labor for quarrying, a small gyratory crusher with smooth concaves and head may be used, setting this to 2-in. screening and returning the oversize to the crusher for recrushing.

As a general rule, better results can be obtained by screening out the dust from the coarse rock before burning. This increases somewhat the capacity of the kiln. This dust also contains a large part of the dirt which finds its way into the quarry so that the writer has found its removal is of advantage in increasing the purity of the lime. In localities where water is abundant, there would be no objection to washing the limestone to free it from dirt as the wet stone would not affect materially the operation of the kiln.

A good requirement for stone is that it shall pass a screen with round perforations 2-in. in diameter and be retained on a screen with round perforations ½-in. diameter. A market can in most localities be found for this fine material.

If there is no market for the dust, however, a slightly smaller mesh screen may be used so as to reduce the waste. With a small gyratory set to 2-in., the quantity of fines will depend on the nature of the stone but will generally amount to not over 10% of the stone crushed.

Feeding the Kiln

The stone can be conveyed directly from the crusher to the kiln bin. It is desirable also to provide a storage so that the kiln can be operated without reference to quarry operations. An excellent type of storage for the stone is the ordinary concrete silo. A silo of 16 ft. diameter by 40 ft. high will hold sufficient stone for 200 tons of lime. The stone may be fed directly from such a small silo into the kiln by means of an automatic feed and a bucket elevator. If the storage is larger, however, it will probably be better to convey the stone as required from the latter to a bin above the kiln.

The feed bin for the kiln should be made of steel and preferably should hold at least 24 hours' supply of stone, unless there is also a storage when, of course, the bin could be very much smaller. Circumstances will indicate the storage required.

The stone may be fed out of the kiln by any appropriate device. The writer has usually employed the ordinary reciprocating table feeder. This should be attached directly to the driving shaft of the kiln so that when the kiln stops revolving the stone ceases to feed. The

* Condensed from a paper read before the American Institute of Chemical Engineers, Montreal, Que., June 28, 1920.

feeder should be adjustable so that the rate can be regulated to suit the operation of the kiln.

The writer prefers to operate the kiln with a variable speed motor. This allows the operator, when the material is not being properly burned, to retard the speed of his kiln. This will cause the material to remain in the latter for a longer time and consequently will allow the heat to act on it to greater extent. When the material is burning well he can speed up his kiln increasing the output, etc. In place of the motor, a speed change can be employed but this is less desirable.

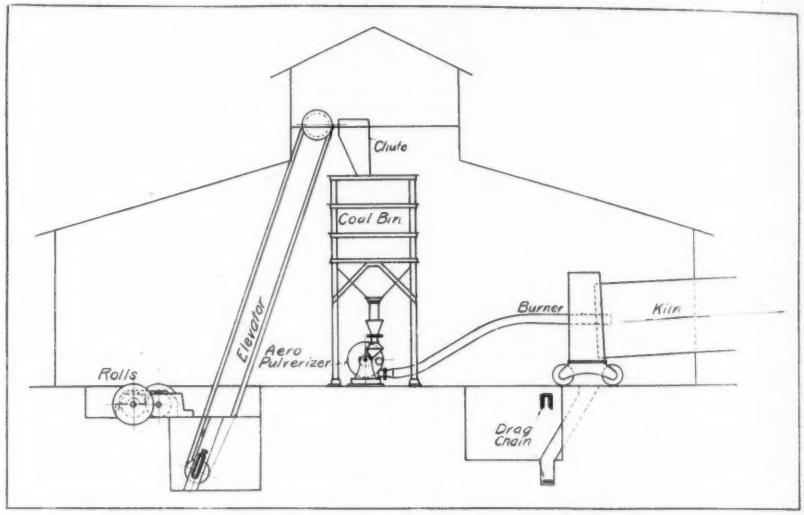
Cooler

The lime will leave the kiln at a temperature very close to 1000°C. It is, therefore, necessary in any large plant to cool the lime mechanically. This is done by dropping it into an inclined revolving cylinder through which a current of air is passed. Usually the air for cooling is drawn through the cylinder by natural draft. The cooler should be so arranged that the hot air will pass into the kiln and consequently the cooler will serve to preheat the air for combustion. A less desirable way of arranging the cooler is to provide it with its own stack, in which case the advantage of the heat in the lime is lost.

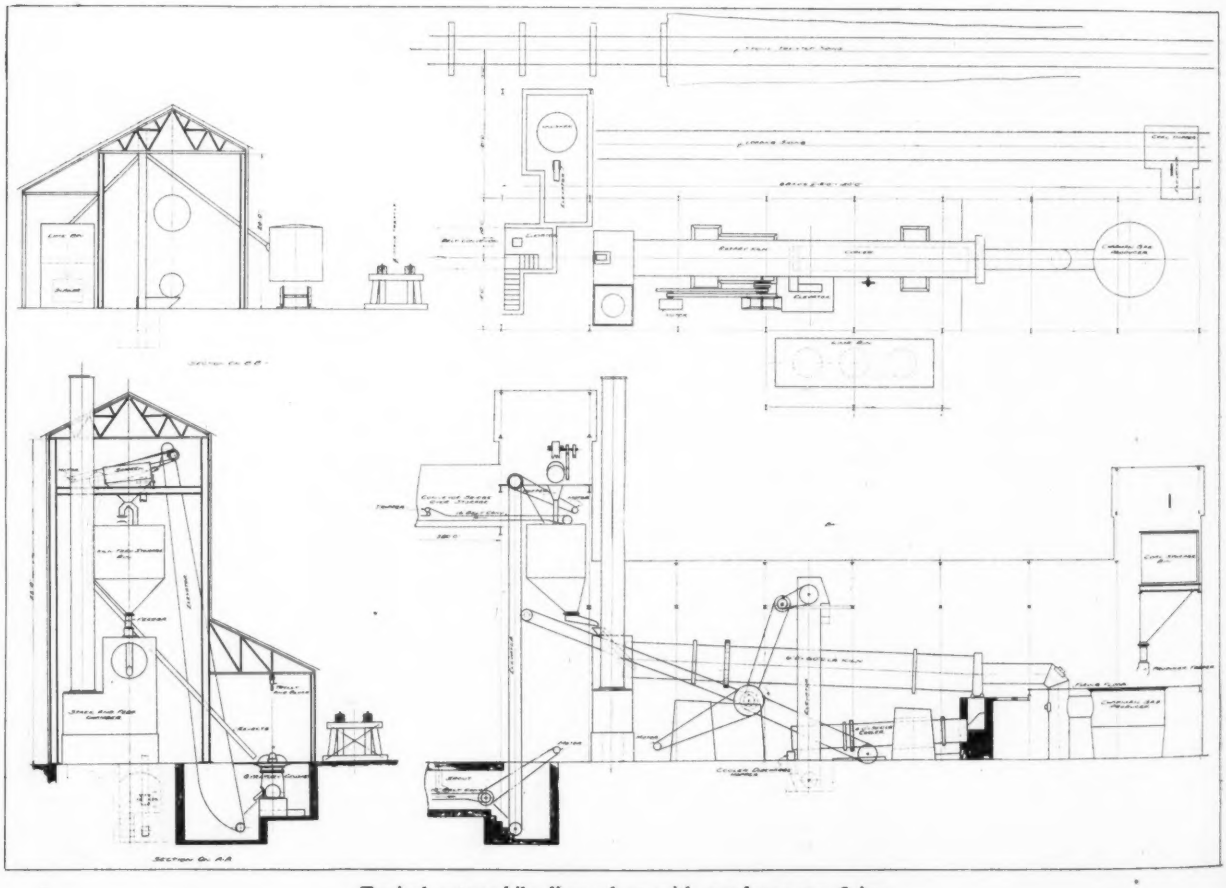
In construction, the cooler is quite similar to a rotary kiln except that in place of a brick lining, the inside of the cylinder has running through it Z-bars or angle-irons, which serve as lifters carrying the material up and dropping it through the current of air passing through and so adding to the efficiency of the apparatus.

Fuels Available for Heating the Kiln

Pulverized coal, producer gas, natural gas and oil are all employed for heating the kiln. Localities where natural gas can be used are few and the cost of oil at the present time is prohibitive in most



Simplest possible pulverized-coal installation



Typical rotary-kiln lime plant with producer-gas firing

sections of the country, so that the fuels generally available are pulverized coal and producer gas. Natural gas is the most convenient fuel and producer gas the most troublesome.

The fuel requirements of a rotary kiln are from 2800 to 3500 B.t.u. per pound of lime or

400 to 500 lbs. of coal per ton of lime

37 to 45 gals. of oil per ton of lime

500,000 to 625,000 cu. ft. of natural gas per ton of lime.

This is better than can be accomplished with the best hand-fired kilns and but slightly less than that claimed for the best types of gas-fired kilns. The quantity of fuel actually required depends just as in the case of shaft kilns upon the nature of the stone, the kind and quality of the fuel, the skill of the operator, and the kiln itself. The most economical kiln is one in which the ratio between length and diameter is greatest. That is to say, of two kilns having the same diameter but different lengths operated under the same conditions, the longer kiln will have the greater fuel economy (and incidentally the greater output also).

Oil is a very convenient fuel to use and the installation costs less except where very large storage tanks have to be provided. When oil is used for a fuel, the apparatus necessary to heat the kiln is similar to that required for heating a boiler with this fuel. Almost any type of burner will work satisfactorily which will atomize the oil and give a conical flame. The writer has used Rockwell, Hauck and Kirkwood burners with success. He has also obtained equally good results with a burner which he had made up from his own design out of ordinary pipe and fittings. In all of his installations he has employed air at from 30 to 40 lbs. pressure for not only atomizing the oil but also for forcing it to the burners.

In this system, there are in addition to the main storage tank, two small supply tanks, each of which will hold a supply of oil sufficient to last the kiln for from 4 to 6 hours and which are capable of withstanding a pressure of 100 to 125 lbs. The two tanks are used so that one will be in service while the other one is being filled. The oil is forced from these tanks to the burner by means of compressed air. The writer's experience has been that high pressure air atomizes the oil better than low pressure air and the use of air to force the oil to the burners does away with the oil pumps, and allows one apparatus to do the work of two.

Producer Gas

Owing to the difficulty of securing oil cheaply in most localities, the average lime manufacturer will have to decide the question of whether he will use pulverized coal or producer gas for heating the kiln. There are some points in favor of each. Producer gas will give the purest quality of lime. Pulverized coal on the other hand will be more economical and easier to handle.

Producer gas burns a nice clean lime. The temperature of the flame obtained is ample to burn good chemical lime and if the producer is a good one and is well taken care of fairly uniformly burned lime, free from core, will be obtained. Producer gas, however, varies with the operation of the producer. The hand-fed, hand-rabbled producers give a gas the quality of which depends very largely on the man who operates them. When such a producer is freshly charged with coal there is a rush of gas through the furnace. The gas then gradually decreases in calorific power until the next charge of coal is put in the producer. Automatically stoked and fed producers operate much more smoothly and if at all well handled this objection is practically eliminated.

The producer should be located under a bunker so that the coal may be fed directly into the hopper of the former. Arrangements should also be made for removing the ashes conveniently. The producer should be located near the kiln so that no more heat will be lost by radiation than is absolutely necessary. The piping should be so arranged that the flues can be cleaned easily. Usually each kiln has its own producer or producers and no valves are inserted between the kiln and producer, the rate at which the producer is operated controling the flow of gas to the kiln. Where two or more small kilns or where other furnaces also are heated from the one producer, etc., valves will, of course, be necessary. In the event a valve is not used, a sand damper or some means of shutting off entirely the producer from the kiln should be provided so that the lining of the latter may be repaired when desired without allowing the fire in the producer to go out, etc.

As an 8x125-ft. kiln will require from 20 to 25 tons of coal to heat it, or a gassification of about 2000 lbs. of coal per hour, it will be seen that one kiln is large enough to have its own producer or producers and one large kiln is always to be preferred to several small ones.

The largest mechanically stoked producers will take care of from 3000 to 3500 lbs. of coal per hour or about 32 to 44 tons per day, but much smaller producers can be obtained with the automatic feed and stoking arrangement.

About 0.4 lb. of steam will be required to operate the producer for each pound of coal gassified. This is equivalent to approximately one boiler horse power per ton of coal gassified in 24 hours. Or an 8x125-ft. kiln would require 20 to 25 boiler horse power.

One man per shift can take care of a mechanically stoked producer with the help of another man part of one shift to get coal into the bunker, take away the ashes, etc.

I estimate the cost of producer gas in the best equipped plant is approximately as follows, figuring on a producer which will gassify 2000 lbs. hourly.

Attendants, 1 man @ $4.00, 3 shifts	$12.00
Attendants, 1 man @ $3.20, 1 shift	3.20
Steam, Coal @ $5	6.00
Supplies, repairs, etc	5.00
Cost per 24 tons of coal gassified	$26.20
Cost per ton	$ 1.09

Added to the above should be the losses from the producer. With smaller producers, cost of attendance would, of course, be more per ton, which would raise the cost of the gas.

Pulverized Coal

The advantages which pulverized coal has over producer gas for heating rotary lime kilns are, first, the much more uniform rate of supply of fuel to the furnace, as where proper feeding devices are used there is a continual supply of fuel to the furnace at a regular and uniform rate and this fuel is of the same thermal value at all times and does not vary in this as does producer gas. Second, with powdered coal the loss of carbon due to that remaining in the ash is avoided. Third, it is possible to burn powdered coal with almost the exact quantity of air necessary for combustion which is not possible with producer gas. Fourth, in the producer, there is also a loss of coal due to carbon completely burned to carbon dioxide, although certain portion of this loss is conserved as sensible heat in the gas and is utilized provided the producer is set close enough to the kiln to cut down radiation losses.

The efficiency of a producer is seldom greater than 85% and is generally less than this compared with pulverized coal.

Experiments which the writer has made indicate that when pulverized coal is used about 40% of the ash of the fuel enters the lime. Assuming, therefore, that 450 lbs. of coal are required to burn a ton of lime and that the ash amounts to 10% of the weight of the coal, one ton of lime would contain 18 lbs. of ash or about 0.9%. Below are two analyses showing lime burned with pulverized coal containing 11% ash and what the same lime would be burned with producer gas.

COMPARISON OF LIME BURNED WITH PRODUCER GAS AND PULVERIZED COAL

	Analysis of Lime Burned with Pulverized Coal	Producer Gas
Silica	2.44	2.10
Iron Oxide and Alumina	1.15	0.80
Lime	94.33	95.00
Magnesia	1.22	1.24
Loss on Ignition	.86	0.86

A larger amount of ash will be retained by lime in which there is a lot of fine material, such as where the fine limestone dust has not been screened out,

than will remain where the dust is screened from the coarse stone. The dust seems to catch and hold the ash rather than to allow it to be carried away by the draft of the kiln.

The cost of pulverizing 24 tons of coal daily is approximately as follows:

Drying the coal—0.2 tons coal @ $5	$ 1.00
Attendants, 1 man, 1 shift, 8 hours @ $4	4.00
Grinding, 400 k.w.h. @ 2c	8.00
Supplies, Repairs, etc	4.00
Cost of pulverizing 24 tons	$17.00
Cost per ton	$ 0.71

It is hardly necessary here to go into the various methods of pulverizing coal. The coal has been dwelt on quite extensively in technical literature the last few years. Sufficient to say, two general systems may be employed for heating the kiln with pulverized coal. One system in which the coal is pulverized and blown into the kiln at the same operation and the other in which the coal is pulverized in a separate plant, the pulverized coal conveyed into a bin at the kiln and fed from this into the burner as desired.

Waste Heat Boilers

The waste gases leave the kiln at about 700°C and hence contain a large part of the heat liberated by the burning of the fuel. This heat can be successfully utilized in boilers as has been done in the cement industry where an efficiency of 70% has been obtained. The weight of gases usually amounts to between 6500 and 7500 lbs. per ton of lime produced. The heat in these gases will, therefore, be approximately 2,275,000 B.t.u. This is about 40% of the total energy of the coal burned, the other 60% being distributed about as follows—decomposition of the limestone 54%, radiation from kiln shell 6%. Of this waste heat 70% has been successfully utilized by waste-heat boilers or about 1,500.000 B.t.u. per ton of lime produced. This is equivalent to 1550 lbs. of steam at a temperature of 212°F or 45 boiler horse power (hours). A kiln burning 4 tons of lime per hour, therefore, would be good for about 180 h.p. Most lime plants are operated in connection with crushing plants, mills for grinding lime, pulverizing limestone or hydrating lime, so that this power can generally be utilized. The kiln and accessories will not require more than one-third of this, leaving about 120 h.p. for outside uses.

If we deduct the fuel required to produce this power from that required to burn the lime, the efficiency of the rotary kiln will far exceed that of any other type. To produce 180 h.p. about 920 lbs. of coal per hour will be required, while to heat the kilns, 200 lbs. of coal per hour will be required, leaving 1080 lbs. of coal charged against the lime burning, or 7.4 lbs. of lime per pound of coal. In the new lime plant of the Eastern Potash Corporation, designed by the writer, this plan is being employed.

Power

The power required to operate a rotary kiln plant will be about as follows per ton of lime produced.

	H.P. Hours	K.w.h.
To crush limestone	2.5	1.9
To revolve kiln, feeder, etc	4.25	3.2
To revolve cooler	1.25	1.0
To pulverize coal separate plant	5.5	4.1
To feed and blow coal into kiln	2.00	1.5
To pulverize coal Aero system	8.00	6.0
Miscellaneous, stone elevator..	1.0	.8
Total where pulverized coal is used	16.5	12.5

This power is considerably more than that necessary to operate hand-stoked kilns but the saving in labor both in the quarry and at the kiln and of fuel in the case of the rotary kiln far outweighs this increased cost of power. In the case of gas-fired kilns, particularly those for which high efficiency is required, the draft is nearly always induced, in which case the power required to operate the fans used to exhaust the gas very nearly balances the power required to operate the rotary kiln.

In comparing the power required to operate the shaft kiln with that to operate the rotary kiln, only that necessary to revolve the kiln and cooler should be considered since the power necessary to crush the stone should be considered in connection with the quarrying of the stone and compared with cost of hand sledging, while the cost of pulverizing coal or making gas should be compared with hand firing of the shaft kiln. In comparing a gas-fired rotary with a gas-fired shaft kiln the cost of making gas would of course be the same in both installations, while I have shown pulverized coal can be more cheaply prepared than producer gas. This leaves about 6½ h.p. hours directly chargeable to the rotary kiln and against it should be balanced the power necessary to elevate the stone to the top of the shaft kiln, induce draft in the latter if employed, etc.

Labor

One man can attend to the kiln provided the stone is placed in the feed bin for him. If there are more than one kiln, one man can attend to as many as three kilns. If the "Aero" pulverizer is employed to pulverize the coal, the kiln tender looks after this also. The coal, however, should be placed in the bin above this for him, so that all he has to do is to see to the proper operation of the kiln, cooler and pulverizer. Any good intelligent man can be broken in to operate the kiln.

Repairs

Repairs to the kiln are light and consist in an occasional renewal of the lining at the lower 20 or 25 ft. of the kiln. The lining of the upper part of the kiln will last for many years but in the hottest part of the kiln the lining must be renewed every 6 to 9 months, although a careless attendant can burn out a lining in a few weeks' time. An allowance of 25 cents per ton will easily take care of repairs to the kiln, relining when necessary and the lubricants, provided the kiln is properly handled.

The cost of producing lime in a rotary kiln plant in the middle Eastern states is about as follows at this time. The first column represents cost with an output of 100 tons daily, stone quarried at the plant and coal at $5 per ton. The second column represents cost with a 30-ton per day plant and coal costs $7.50 per ton.

Stone, 2 tons	$1.50 to $2.50
Coal, 0.2 tons	1.00 to 1.50
Labor	.20 to .60
Power, 15 k.w.h.@2c	.30 to .45
Repairs, supplies, etc	.25 to .35
Total	$3.25 to $5.40

Under existing conditions (June, 1920) a rotary kiln lime plant of the best construction will cost approximately $950 per ton of lime produced per day. This figure includes a steel building entirely over the kiln and a pulverized coal plant or mechanically stirred producer, of which amount the kiln, cooler, and gas producer will constitute about 60% and the building, bins, motors, etc., the other 40%.

It is not absolutely necessary to cover the whole kiln with a building which will also reduce the cost from the above figure. A frame building covered with corrugated iron roofing and with either the latter material or cement stucco siding can also be used without great fire risk. In some localities the siding may be left off.

Production of Sand-Gravel in New Jersey

THE PRODUCTION of sand and gravel in New Jersey during the past year exceeded in value that of any previous year according to a bulletin issued recently by the State Department of Conservation and Development. The quantity production was also greater than during the preceding year, but has been exceeded in the past, when prices were lower. Last year 3,710,226 short tons of both materials sold for $2,576,272, while the preceding year 3,579,862 short tons brought $2,462,864.

Sand was the principal product, being 2,794,627 short tons, valued at $2,013,222. This total includes sand for building, moulding, glass-making and other purposes. During the previous year 2,688,-116 short tons of sand were sold for $1,969,144. Gravel increased in production from 880,746 short tons in 1918 to 915,599 in 1919, and in value from $493,-720 to $563,050. The average price per ton was 61 cents.

Burning Limestone for Both Lime and Carbonic Acid Gas

III—Chemistry of Lime Burning, Continued—Calculation of the Amount of Carbon Dioxide

TWO PREVIOUS ARTICLES have described the kiln used in burning lime for the beet sugar industry and the chemistry of lime burning in a pot kiln using coke for fuel. It will be remembered that the handling and recovery of the carbon dioxide gas from the burning limestone is one of the principal features of the process.

The volume of a gas increases in proportion to the absolute zero which is 273° Centigrade below the freezing point of water, thus if the temperature of the gas at the pump is 50° C., its absolute temperature is 273 plus 50 = 323°, and the increase in volume is as 323/273 = 1.183. Multiplying the calculated volume at zero by this factor gives the volume at 50° C.

A reduction of the pressure below 760 millimeters also causes an increase in the absolute volume, which increase is inversely proportional to the decrease in pressure below 760 millimeters. Thus if the observed pressure should be 630 mm. of mercury, the increase in volume would be as 760/630 = 1.206, multiplying the volume last above found by this factor, gives the actual volume of gas under the observed conditions.

To facilitate making these calculations, tables have been calculated, showing the factors for temperatures between zero and 100° and pressures from 560 to 630 mm. of mercury, also the corresponding inches of water. These tables will probably cover any ordinary conditions.

TABLE OF FACTORS FOR TEMPERATURE CORRECTION

Multiply the calculated volume of gas at 0° C. and 760 mm. by factor.

Temperature (°C.)	*Factor*	*Temperature (°C.)*	*Factor*
5	1.018	55	1.202
10	1.036	60	1.220
15	1.055	65	1.238
20	1.073	70	1.256
25	1.091	75	1.274
30	1.110	80	1.292
35	1.128	85	1.310
40	1.146	90	1.329
45	1.164	95	1.347
50	1.183	100	1.366

TABLE OF FACTORS FOR PRESSURE CORRECTION

Multiply the calculated volume of the gas by the factor.

Absolute Pressure MM Mercury	*Factor*	*Absolute Pressure MM Mercury*	*Factor*
630	1.206	595	1.276
625	1.216	590	1.290
620	1.226	585	1.300
615	1.236	580	1.312
610	1.246	575	1.323
605	1.256	570	1.335
600	1.266	565	1.343

As pressures are generally observed in inches of water, it is useful to have a table for inches of water corresponding to millimeters of mercury. To use this table, observe the inches of water and find the millimeters of mercury closest to the observed inches of water.

TABLE SHOWING INCHES OF WATER EQUIVALENT TO MILLIMETERS OF MERCURY

Inches of Water (Vacuum)	*Absolute Pressure Millimeters of Mercury*	*Inches of Water (Vacuum)*	*Absolute Pressure Millimeters of Mercury*
1.0	628.2	16.0	600.3
2.0	626.3	17.0	598.6
3.0	624.5	18.0	596.6
4.0	622.6	19.0	594.6
5.0	620.7	20.0	592.6
6.0	618.9	21.0	591.2
7.0	617.0	22.0	589.2
8.0	615.1	23.0	587.4
9.0	613.3	24.0	585.5
10.0	611.1	25.0	583.6
11.0	609.6	26.0	581.6
12.0	607.8	27.0	580.0
13.0	605.9	28.0	578.0
14.0	604.0	29.0	576.2
15.0	602.0	30.0	574.6

Fig. 2 has been calculated by the use of some of the factors above given, to supply a ready method of determining the percentage of CO_2 in the gas from any given combination of percentage of $CaCO_3$ in the limestone and percentage of carbon on limestone. In order to use this chart, it is first necessary to determine the percentage of CO_2 in the original pure gas, by calculating the proportion of air admixture as previously illustrated.

This chart can be used in a number of ways. Knowing the percentage of $CaCO_3$ in the limestone, the percentage of carbon in the coke, and the percentage of coke used, it can be used to show whether or not combustion and decomposition are complete in the kiln. For example, if we have 98 per cent of $CaCO_3$ in the limestone, and are using 10 per cent of coke containing 90 per cent of carbon, the percentage of CO_2 in the gas as shown by the chart should be 37.4.

Knowing that the limestone is completely burned and that the coke is all consumed, to determine the relative amount of each which is being used, we have only to analyze the gas and consult the table. If the quantities thus found do not correspond quite closely to the weights shown in the reports, we know that there is some error, either in the weights of the coke and limestone, or in the analyses used. It very frequently happens that gas analyses as recorded upon the laboratory records, upon being subjected to this examination, indicate impossible conditions, due to improper taking of the sample or careless performance of the analyses, but such results are generally so far from correct as to be apparent upon first inspection.

It is apparent that the gas pump is the controlling factor in the production of lime, because a definite quantity of gas must be pumped for each ton of lime produced, and therefore the lime can be produced only as the gas is removed. Leaving for later discussion the influence of the size of the lime kiln upon capacity, let us see what can be learned by a few calculations regarding the gas pump.

In Fig. 1 and the notations at the bottom of same, it is shown that in order to pump the quantity of pure CO_2 gas produced when 100 tons of limestone, of 100 per cent $CaCO_3$, are burned with 10 per cent of carbon on limestone, it will require 31 revolutions per minute of a duplex gas pump of the ordinary type, with cylinders 18 in. by 30 in., but since the gas as actually pumped contains so much nitrogen and air, that it has only, say 33 per cent CO_2, and since moreover it has a temperature of 50° C., and the pressure at the pump suction is 10 inch water vacuum, the actual volume to be pumped is greater. Further, instead of 100 per cent of $CaCO_3$ in the limestone, we have only 96 per cent and the carbon is 9 per cent on limestone instead of 10 per cent, as assumed in the Chart, and instead of 100 tons of limestone to be burned we may have any number of tons.

Three formulas can be derived, from the information which we now have, to calculate any of these values.

Let the tons of limestone to be burned be designated by.....R
The proportion of gas by Fig. 1 by.....P
The volume of gas at observed temperature by .....T
The volume of gas at observed pressure by V
The per cent CO_2 by analysis in the gas by .....G

The R. P. M. of the pump by.....M
Then—

$$M = \frac{31 \times R \times PTV}{G} \text{ and } R = \frac{M \times G}{31 \times PTV} \text{ and } G = \frac{31 \times R \times PTV}{M}$$

By applying one or all of the above three formulas to actual performance of a lime kiln installation, many valuable lessons may be learned, and generally it is found that things are not what they are supposed to be.

If the capacity of a typical gas pump is, say, 0.834 cubic meters per revolution, to apply these formulas to any other size of gas pump it is only necessary to multiply the value (31) in the chart by a factor representing that which the capacity of the pump in question bears to a 834 cubic meters, or better to make a recalculation of Fig. 1 to fit the case, which will result in a value other than 31, as in the example, and which value is to be substituted for it in the chart and formulas.

It is clear that the less the volume of gas from a unit quantity of limestone, the less pump capacity is required. This knowledge is of great value in modern beet sugar plants where the slicing capacity has been greatly increased until it is necessary to crowd the lime kilns to the utmost to produce the amount of lime required.

Thus we have seen, that the volume of gas per ton of lime is increased by an increase in the percentage of carbon in the coke, by higher vacuum as pumped, by higher temperatures as pumped, and by leakage of air into the gas, so that all these points should be looked to if one desires capacity, it being generally the case, that the gas pumps are operated at the highest allowance speed, with no auxiliary available. The savings to be made by reducing the amount of coke will be gone into later. The remedies for the other conditions mentioned are so obvious as to be easily discovered upon inspection.

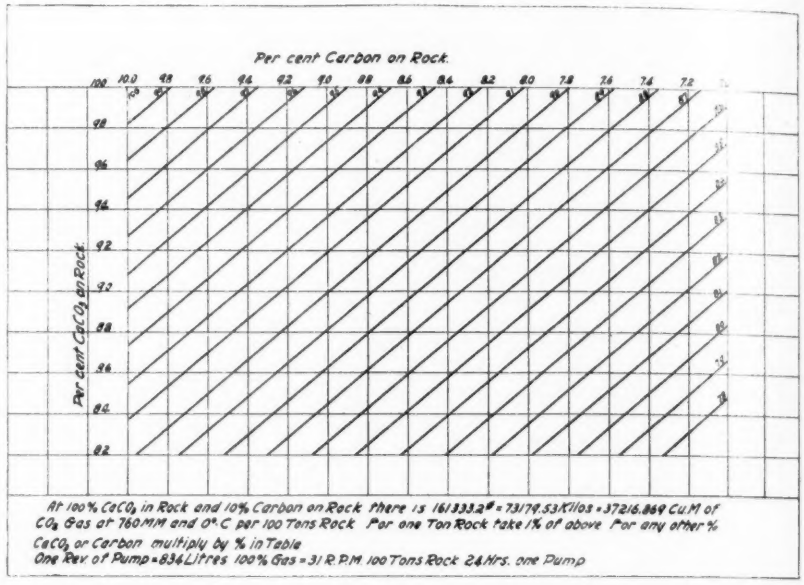
So far, only the chemical reactions, and calculations of the quantities of the materials and products, have been discussed. These reactions and calculations will be found a very useful guide to the development of operating practice, and a better understanding of the whole problem of burning lime. For these reasons they should be mastered before taking up the discussion of the practical operation of lime kilns which follows.

As far as operating practice is concerned, a lime kiln may be compared to a furnace, as the factors influencing the one apply to the other, with some modifications. The heat consumption of a lime kiln is made up of the following components:

1. That required to raise the temperature of the rock to that of the dissociation temperature.

2. That required for the dissociation of the calcium carbonate.

Total coke introduced =	9.0% on limestone = 100%.	
To supply 1 and 2	5.970% =	66.4% of the coke used
Loss in gas	1.374% =	15.3% of the coke used
Loss in lime	0.337% =	3.7% of the coke used
Loss in excess air	0.132% =	1.4% of the coke used
Radiation losses	1.187% =	13.2% of the coke used
Total	9.000% =	100.0% of the coke used



3. That required to make good the losses.

The amount of heat required for 1 may be calculated from the temperature and the specific heat of limestone. The amount of heat required for 2 may be taken as 425 calories per kilogram. The losses are determined by difference.

The heat losses may be separated into the following divisions:

1. The heat required to raise the temperature of the total lime kiln gas from the temperature of the entering air, to the temperature of the gas on leaving the kiln.

2. The heat required to raise the temperature of the lime as drawn from the kiln, above the temperature of the limestone entering.

3. The radiation losses.

To calculate a heat balance and segregate the losses so that their relative importance can be realized, the Calories in the coke are debited, then credited with the various items of heat required, the losses are calculated and credited, and the difference between this total and the amount credited is the radiation loss.

A typical result of such a calculation, which is described in detail at the end of this lecture, is as follows:

The main opportunity for heat economy in this case is seen to be in reducing the temperature of the exit gas, and in reducing radiation. Another small economy, which is sometimes not insignificant, is that of avoiding a reduction of CO_2 to CO, as this will absorb heat which otherwise would perform useful work.

(To be continued)

Bureau of Public Roads Just Completing Survey of Gravel Plants

THE UNITED STATES BUREAU OF PUBLIC ROADS is just completing a field inspection of sand and gravel plants undertaken this last season chiefly to determine the nature of the various commercial sand and gravel deposits, the character of the developments, the capacity of sand and gravel plants, and the extent to which their operations have been curtailed this year by railway-car shortage.

The information collected by the Bureau of Public Roads should show, when properly summarized, the power and labor requirements of the industry and its normal capacity. Apparently the data collected will not show the capital invested in the industry, which is unfortunate.

If the data collected in regard to the restriction of the industry due to lack of transportation agrees with statistics, collected by ROCK PRODUCTS, the U. S. Bureau of Public Roads will do the sand and gravel industry an invaluable service by making its findings available to the Car Service Commission, the Interstate Commerce Commission and some other national agencies that have had a hand in the making of the 1920 pie.

Lime a Basis of White Paint--Old-Fashioned Whitewash

Some of the Virtues of Lime Whitewash which Cheap Oil Paint Substitutes Do Not Have

A CERTAIN NEW ENGLAND FARMHOUSE, at a high altitude and in a very exposed position, will not stay *white* when painted with modern oil paints. The owner, a New York City architect, is going to whitewash that house with a whitewash prepared according to the formula of the U. S. Bureau of Lighthouses. Probably that house and that architect's experience with it is typical of a great many in New England and elsewhere.

In the colonial days lime was a household commodity and its use for whitewash for both exterior and interior work was widespread. It had then and still has many virtues as a paint. It is *white* and stays white while many modern oil white paints will not. It is antiseptic—a germ killer—and consequently it preserves wood quite as effectively as the best oil paints.

Whitewash then fulfills the two principal functions of a modern paint—it gives color to the surface and it prevents decay. But like many other old-fashioned household uses of lime its value as a paint has been largely lost sight of and a great variety of more expensive but less satisfactory substitutes have taken its place. It is now quite possible that its long forgotten virtues will be again recognized and that it will come again to its own.

Forthcoming Bulletin on Whitewash

The National Lime Association, largely through the activities of Tyrrell B. Shertzer of the Eastern Bureau, is now preparing a bulletin on whitewash and cold water paints of which lime is the basis. This will be a distinctly valuable contribution in calling attention to some of the virtues of lime that have long been overlooked. In this investigation of the subject Mr. Shertzer has established the following facts:

Whitewashes and cold water paints should always be laid on and no attempt should be made to brush out as is done with oil paints.

Alum added to whitewash prevents its rubbing off.

Flour paste will also prevent rubbing off but when it is used zinc sulphate must be added as a preservative.

Molasses makes lime more soluble and causes it to penetrate wood, plaster, etc., better. One pint of molasses to 5 gallons of whitewash is enough to use.

Silicate of soda solution (35° Baume) makes a fireproof cement of whitewash when used in the proportion of one part of the solution to ten parts of whitewash. (Silicate of soda is water glass.)

By adding 1 pound of cheap bar soap dissolved in 1 gallon of boiling water to every 5 gallons of whitewash, a gloss similar to oil paint can be obtained.

Bureau of Lighthouses Formulas

George R. Putnam, commissioner of lighthouses, states: "Whitewash made from the formulas given herewith have been used mostly on old brick and masonry towers and on fences, etc., it being considered nearly as good as paint and much cheaper. It is usually applied every spring." The formulas are:

Whitewash

Slake half a bushel of unslaked lime with boiling water, keeping it covered during the process. Strain it and add a peck of salt, dissolved in warm water; three pounds of ground rice put in boiling water and boiled to a thin paste; half a pound of powdered Spanish whiting, and a pound of clear glue dissolved in warm water; mix these well together, and let the mixture stand for several days. Keep the wash thus prepared in a kettle or portable furnace, and when used put it on as hot as possible, with painters' or whitewash brushes.

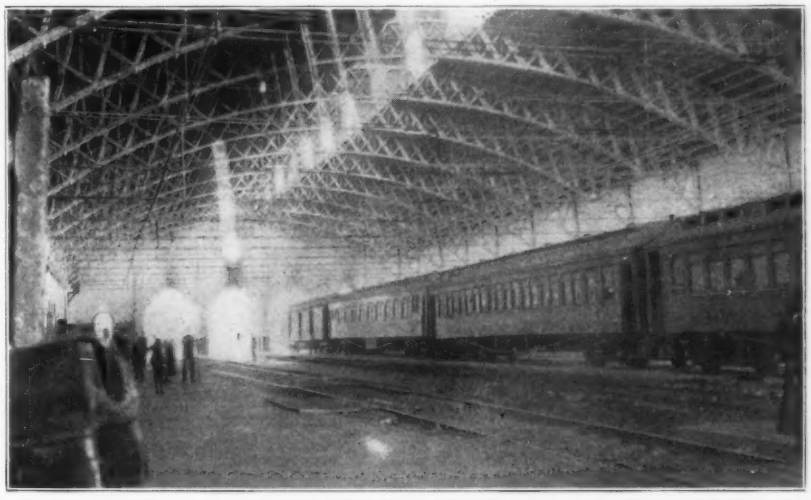
A Simpler Whitewash

The following formula for mixing whitewash, when properly made and put on, gives a white that does not easily wash or rub off, viz:

To ten parts of best freshly slaked lime add one part of best hydraulic cement; mix well with salt water and apply quite thin.

Railroad Also Values Whitewash

On a recent trip to St. Albans, Vt., the editor was struck with the excellent condition of the trainshed roof of the Central Vermont Ry. station. A view of this is shown herewith. C. E. Donaldson, supervisor of bridges and buildings of this railway states:



Trainshed roof at St. Albans, Vt. Trusses preserved for over half a century with lime whitewash

Our records show that train shed was built in 1868 and there have been no repairs or renewals to trusses since erection of building. Same has been whitewashed on an average of once in four years. Am unable to advise you what formula has been used, but at the present time we are using just common whitewash, similar to that used on cattle guards, stock yards, etc.

You ask my opinion in regard to using whitewash as a timber preservative. I am satisfied from personal experience that it does preserve our native timber such as spruce, hemlock and other soft wood.

Every engineer and architect knows that a trainshed roof is the hardest possible service any structural material can be put to, yet here we have a roof, possibly the oldest of its kind in this country, still in A-1 condition after more than half a century of service. Not only are the timbers in an excellent state of preservation, but the iron bolts and rods are equally well preserved from the cor-

rosive gases of the locomotives. Lime whitewash did it.

And so doubtless one could find other sections of the country where old-fashioned practices have held on despite of the propaganda of modern paint manufacturers until today we are forced to admit their virtues and are just beginning to see a return to those practices by people who are being educated to the fact that things need not be discarded just because they are old.

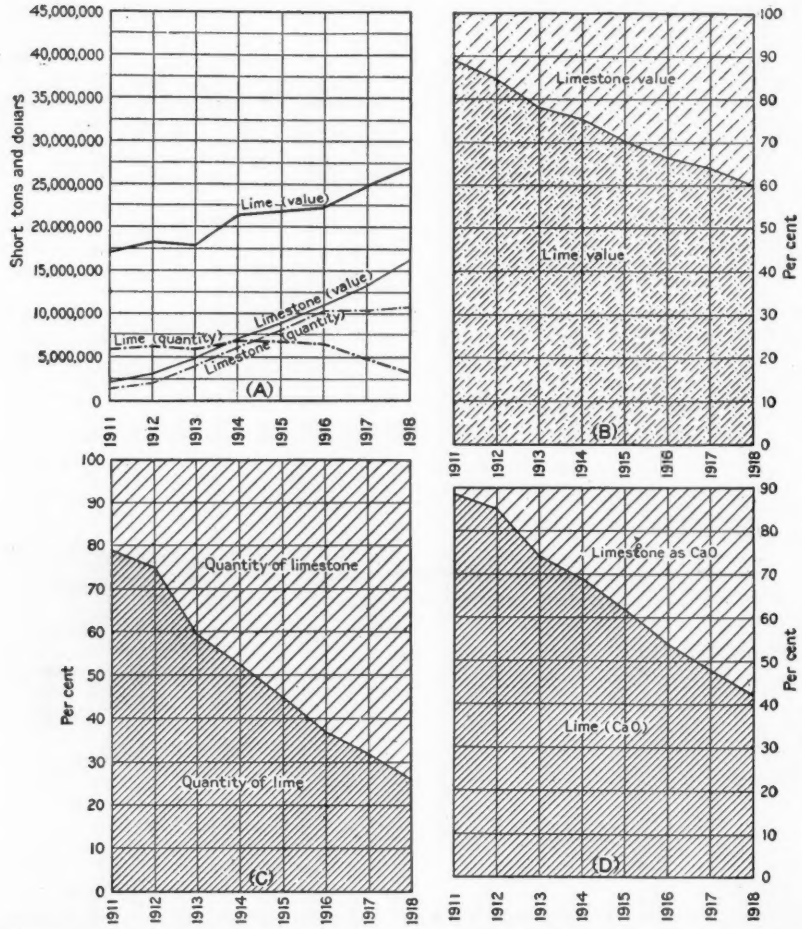


FIGURE 114.—Relations between sales of pulverized limestone and burned lime for agriculture, 1911–1918: A, quantity and value; B, percentages of total value; C, percentages of actual quantity; D, percentages of quantity in terms of calcium oxide (CaO).

Lime and pulverized limestone sold for use in agriculture, 1911–1918.

Year.	Lime		Limestone.	
	Quantity (short tons).	Value.	Quantity (short tons).	Value.
1911	596,664	$1,714,386	174,290	$205,006
1912	604,607	1,852,530	200,000	311,702
1913	590,229	1,798,566	408,627	493,718
1914	684,348	2,139,444	615,197	688,961
1915	673,260	2,163,874	810,399	893,530
1916	613,564	2,224,058	1,043,876	1,109,208
1917	488,297	2,475,731	1,040,248	1,352,397
1918	391,047	2,698,848	1,091,918	1,626,292
Average price per ton		6.90		1.49
Increase or decrease (per cent)	−19.9	+9.0	+4.9	+20.3

Statistics of Agricultural Lime and Limestone*

PULVERIZED LIMESTONE for agricultural use which since 1911 has shown a practically steady increase, recovered in 1918 from the slowing up of the industry during 1917 caused by difficulties of transportation and labor. The decrease of less than 1 per cent in 1917, followed by an increase of about 5 per cent in 1918, seems to show the permanence of this comparatively new industry. The output in 1918 was 1,091,918 short tons, valued at $1,626,292, a record production. The average price per ton was $1.49—19 cents more than in 1917. The burned lime sold for this purpose amounted to 391,047 short tons, a decrease of 20 per cent in 1918, and 34 per cent less than the output in 1911. The relations between sales of pulverized limestone and burned lime for agriculture are shown in the accompanying table and in Fig. 114. In examining Fig. 114, D, however, it should be borne in mind that not all of the calcium oxide in limestone may be available for rapid reaction in the soil, as only that portion finer than 60-80 mesh can be considered equivalent to burned or hydrated lime in rapidity of reaction, whereas some of the agricultural limestone sold contains a considerable percentage of coarser material.

The pulverized limestone industry was affected by the shortage of fuel less than the lime industry, and the present high price, the scarcity of fuel, and the increased cost to the producer may prevent burned lime from resuming its normal for a considerable time. The total quantity of limestone quarried in 1918 for use by farmers was about 1,870,000 tons, whereas in 1917 it was about 2,000,000 tons and in 1916, 2,270,000 tons. In addition to pulverized limestone and burned lime, 78,232 tons of calcareous marl, valued at $203,500, was sold for this use.

In 1918, as in 1917, Illinois was the leading State in quantity of output of ground limestone for agriculture, but Pennsylvania, the third in quantity, stood first in value. Michigan ranked second in quantity. Illinois and Michigan increased in both quantity and value of output, and Pennsylvania decreased in output with increase in value. New York showed decided decrease in both.

[The report from which these data are taken was written early in 1919, and is just now (October 11, 1920) published. From our own knowledge of the industry in the last two years, 1919 and 1920, we are inclined to believe that agricultural limestone production increased very appreciably in 1919 and that the 1919 rate of production was approximately maintained this year of 1920 in spite of the many handicaps.—Editor.]

* From the U. S. Geological Survey Report on "Stone in 1918," by G. F. Laughlin and A. T. Coons.

Cleaning Rock Phosphate by Air Separation Process

New Plant of the Tennessee Agricultural Chemical Company Is a Departure from Current Practice

CLEANING ROCK PHOSPHATE with air instead of washing it with water is quite a new thing. But this is the method being used by the Tennessee Agricultural Chemical Co., in its new plant at Mt. Pleasant, Tenn. The advantages claimed for this method of separating the phosphate from the silt and fine silica sand are: That it requires less coal to dry the phosphate (because it does not go to the dryers saturated); and that there is absolutely no waste of material as in the wet process. Each cubic yard of material mined, it is claimed, will make a ton of dried phosphate. The loss from washing is said to be from 18 to 27 per cent.

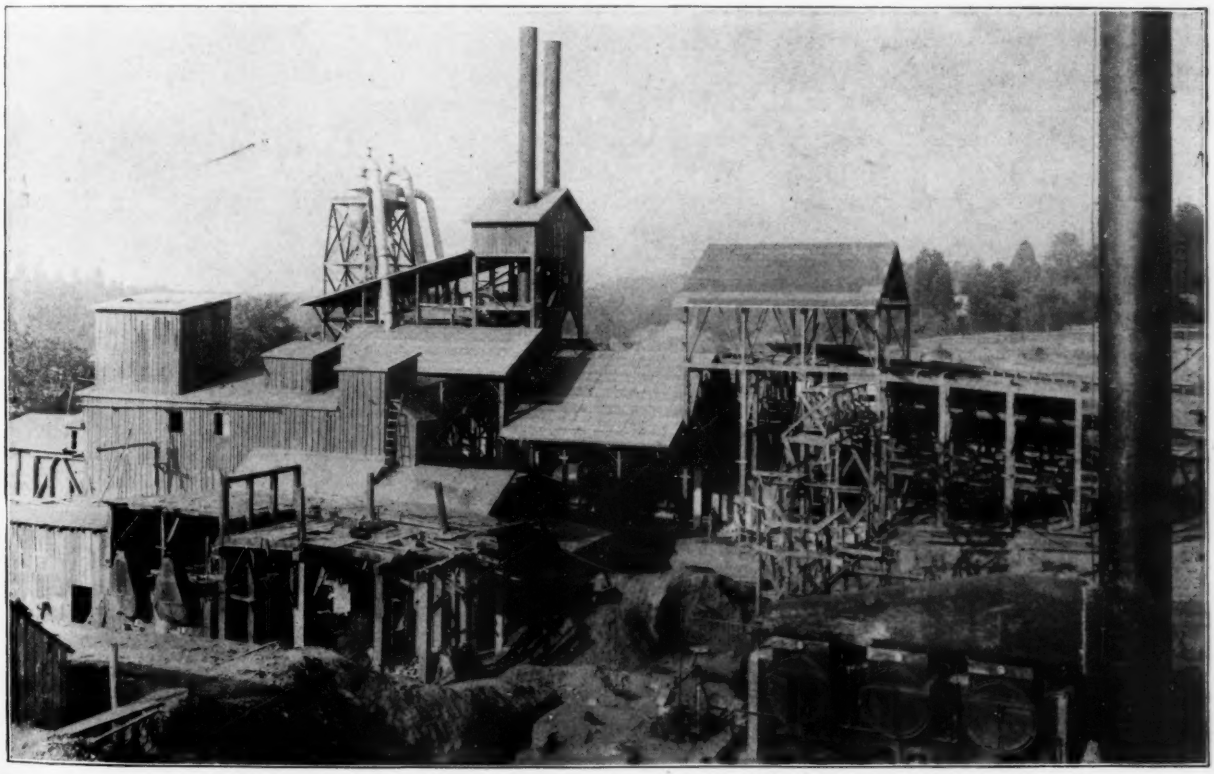
This company is now mining virgin territory where the nature of the deposit will eventually require different mining methods. At present the overburden is being removed by a drag-line machine with a 4-cu. yd, bucket. Cuts are now being made across the foot of the hill, but as soon as the work gets farther up the grade and the overburden gets deep the mine will be tunneled. The mining machine, which is also a drag-line, but has a 1¼-cu. yd. bucket, follows the stripping operation. The material is cleaned up from crevices of the underlying limestone by hand loading.

Two dinkey engines and side-dump cars are used to transport the material to the plant. A new 50x200-ft. green rock storage is now being constructed, where the material will get an opportunity to air-dry before being fed into the dryers.

The dryers are of special design and operate under forced draft. The inside of the rotating shell has cleats which cause the material to tumble or cascade through it, thus knocking the dust loose from the rock. The material is fed into the hot end of the dryer and is quickly dried by the high temperature—900 degrees F. As the material is cascaded around the shell of the dryer it is separated from the fine silt and silica, which is removed by a forced draft, so regulated that it will blow the fine material out, yet will not remove any of the heavier phosphate.

The phosphate discharges from the cool end of the dryers to a cooling space. From here it is elevated to the pulverizers. The pulverizing machinery consists of two standard high-side Raymond mills, where more of the very fine impurities are again removed by air separation. The finished product is either delivered directly to the cars or is put into a bin above a four-valve Bates bag-packing machine.

The pictures which accompany this article were taken while the plant was under construction. It will have a daily capacity of 200 tons or will produce about



A structural view of the Tennessee Agricultural Chemical Company plant at Centerville, Tennessee. The plant has since been completed and the power plant covered—and also the large green rock storage near the cylindrical driers

50,000 tons of ground rock per year.

The officers of the company are H. H. Melville, president; H. D. Friedman, secretary, and W. A. Gray is the sales manager.

Florida Rock Phosphate Development

THE Farmers' Co-operative Phosphate and Fertilizer Co., which was recently organized in Mulberry, Fla., with $5,000,000 capital, has purchased 3,700 acres of phosphate land, estimated to contain nearly 10,000,000 tons of pebble phosphate rock averaging 65 to 75 per cent bone phosphate of lime. Additional lands, estimated to contain several million tons, have been contracted for. A phosphate plant located on the first tract is being improved to give an annual mining output of 50,000 tons.

Calcareous Marl Produced in 1919

THE PRODUCTION of calcareous marl in the United States in 1919 amounted to 91,437 short tons, valued at $327,294. The total production in 1918 was 98,694 short tons, valued at $261,082, a decrease of 7 per cent in quantity but an increase of 25 per cent in value, according to figures made public by the United States Geological Survey, Department of the Interior. The average price was $3.58 a ton in 1919, compared with $2.65 in 1918. The price of marl at individual plants throughout the country were $2.50, $3, $4, $5, $6.50, and $7 a ton. More than 85 per cent of the output was used directly in agriculture. This material is used also in preparing patent fertilizers and in neutralizing acid waters. At a few places it is prepared for market by a simple process of screening and drying, but elsewhere it is dried in rotary dryers and crushed, screened, and pulverized to the required fineness. It is shipped both in bulk and in sacks.

The localities of production and the kind of product obtained in 1919 were as follows: "Clam shell" marl from Edenvale, Santa Clara County, Calif.; marine marl from Jones County, near New Bern, N. C., and near Charleston, Charleston County, S. C.; fresh-water marl from Harmonsburg, Crawford County, Pa.; Barber, Alleghany County, Daleville and Springwood, Botetourt County, Marlbrook and Riverside, Rockbridge County, and Claremont, Surry County, Va., and from Charlestown, Jefferson County, W. Va. Chalk from White Cliffs, Little River County, Ark., is also included, as it was sold for agricultural use. In only one State, Virginia, was there more than one producing company, and the total output of the State was 51,154 short tons, valued at $176,780, compared with 39,770 short tons, valued at $100,518, in 1918, an increase of nearly 29 per cent in quantity and of 76 per cent in value. The average price for the marl produced in the State in 1919 was $3.46 a short ton, an increase of 93 cents over the average price in 1918.

The employees that do not live in the company's houses are hauled to and from work

Tractor mounted 4-cu. yd. drag line for removing the overburdens—a similar machine with a 1¼-cu. yd. bucket is used to mine the phosphate

Commercial Crushed-Stone Quarry as Contractor's Side Line

Chickamauga Quarry and Construction Co. Operates a Legitimate and Not a Portable Plant

INEXPERIENCED contractors often operate portable crushing plants—for a while—but only an experienced contractor would go into the commercial crushed-stone game. The experienced contractor knows the value of crushed stone from a developed ledge, and he knows the economy of large scale quarry operations over dinky ones.

The Chickamauga Quarry and Construction Co., Chattanooga, Tenn., is such a contractor. Needing crushed stone for its own construction contracts and seeing a future in the crushed-stone industry this progressive Southern engineering and contracting firm has developed a commercial quarry just a few miles from Chattanooga.

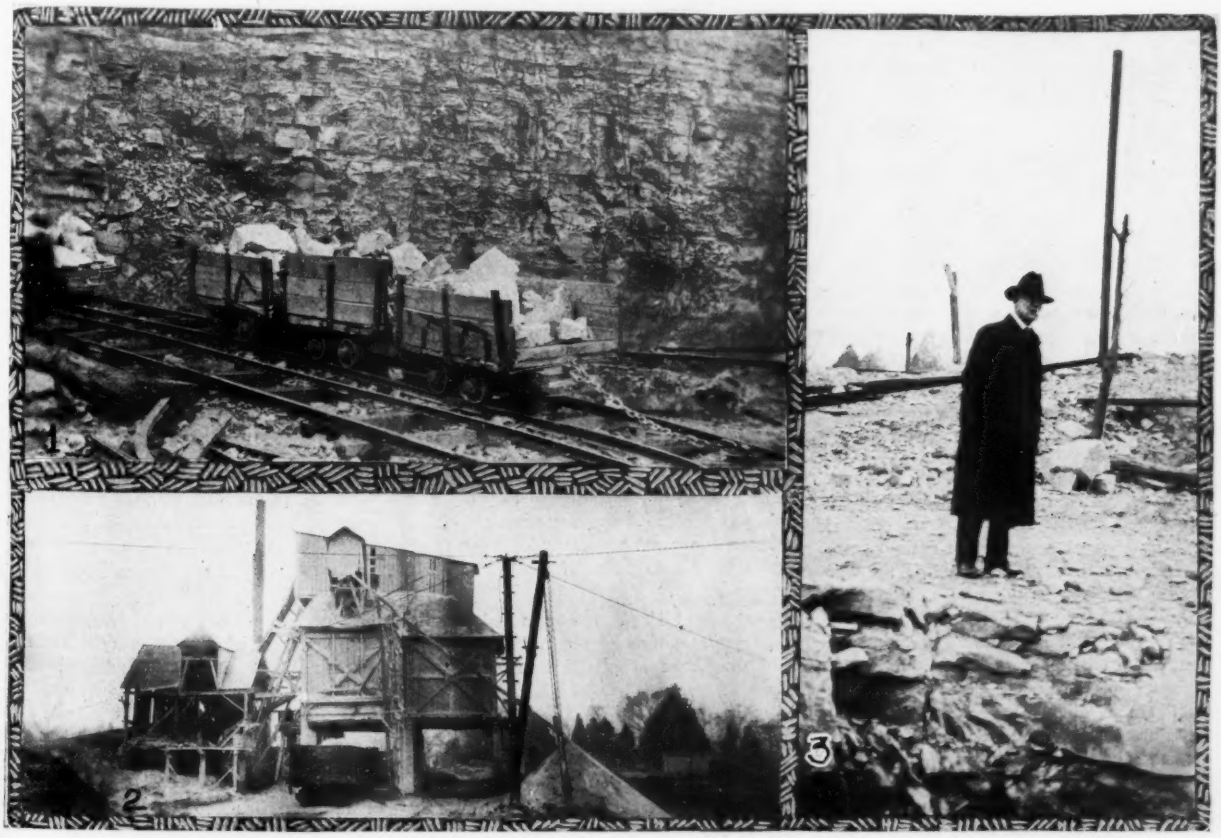
The stone is a high calcium carbonate and is equally valuable for agricultural limestone and for construction work. Considerable railway ballast business also has been done in the past, but owing to the irregularity of the demand for this the company does not specialize in its production.

The stone is excavated by a 90-ton tractor mounted steam shovel with a 1½-cu. yd. dipper, and is transported to the plant by wooden cars of 2 tons capacity. A No. 6 gyratory crusher and a 48-in.x18 ft. screen are used to make the commercial sizes. The plant is operated by a 160 h.p. reciprocating steam engine.

Since the quarry is below the ordinary ground level, one of the big problems is drainage. This is very satisfactorily taken care of by a No. 8 Emerson steam syphon. The plant has a daily capacity of 500 tons. Walter S. Holmes, who is a graduate civil engineer, has charge of the engineering end of the company, and also supervises the operation of the quarry.

Rates on Stone Must Be Equal on Same Haul in Each Direction

A RATE of 32.5 cents per 100 pounds on crushed stone from New Braunfels, Tex., to De Ridder, La., was and is unreasonable to the extent that it exceeded and exceeds a rate of 9 cents maintained on like traffic to other points in Louisiana, and reparation should be awarded, Examiner E. L. Gaddess proposes that the Commission hold in a tentative report in No. 11447, J. M. Pearson vs. M. K. & T. of Texas et al. The shipments moved in January, 1920. The examiner points out that the Commission, in Natchez Chamber of Commerce vs. L. & A. Ry. Co. (58 I. C. C., 610), prescribed rates and description on sand and gravel for 450 miles and less between Natchez, Miss., and points in Louisiana west of the Mississippi River, the same as contemporaneously in effect for like distances between Shreveport, La., and points in Texas, carload minimum 80,000 pounds, or marked capacity of car if less. He follows this finding in his report. The rate of 9 cents, which is found reasonable, may be increased in the manner and to the extent authorized by the Commission in the advanced rate case, the examiner says.—"Traffic World."



Quarry and crushing plant of the Chickamauga Quarry and Cohstruction Co. near Chattanooga—Walter S. Holmes, general manager and chief engineer

The Specific Changes Necessary In Esch-Cummins Railway Law

Let Us Return to the Principles of Non-Discrimination Between Shippers, for the Enforcement of Which the Interstate Commerce Commission Was Created

By John Prince
Chairman of the Executive Committee, Missouri Valley Mineral Aggregate Association

THE MINERAL AGGREGATE INDUSTRY of the Missouri Valley, representing the producers of sand, gravel, chat and crushed stone, in the states of Western Missouri, Kansas and Oklahoma, makes the following statement to the members of the Senate Committee on Reconstruction and Production (Senator Calder of New York, chairman).

This industry represents an annual production of approximately five million tons of the aggregates mentioned, all of which enters into the construction work of this district.

The average increase in the price of mineral aggregates in this district for 1920 as compared with 1914 has been in the neighborhood of 100% whereas the average increase of ten commodities as given by Babson, for the year 1920 as against 1914, has been about 220 per cent. A fair illustration of the average increase in the cost of mineral aggregates in this district is shown by the cost to the consumer of sand, at the average delivered point in Kansas City:

	1914	1920	Increase %
Sand per yard, less discount	$ .50	$ .93	86
Freight and war tax	.26	.67	158
Yardage	.14	.25	60
Drayage	.50	.70	40
	$1.40	$2.55	82

It will be noted from the above table that the largest increase is the increase of freight which if eliminated shows an increase of those items controlled by the producer of 65%.

The freight rates on mineral aggregates in this territory have increased to such an extent that they have greatly increased the cost of the commodity to the consumer. A careful check of 5266 cars shipped by five producers in different parts of this territory shows an increase in freight since June 1, 1918, of 82%, or including the war tax of 87½%. Of these cars, 1486 were moved on switch movement or equivalent. The revenue paid the railroad per ton mile on the short haul movement has increased from 2.1 cents per ton mile to 4.5 cents per ton mile while the revenue derived by the railroads from the balance of the cars showing an average haul of 70 miles has increased from 95 cents per ton to $1.73 per ton mile. Considering the nature of the commodity we feel that these rates are excessive and result in an undue burden on the construction industry.

The rate now paid on sand from Kansas City to Pittsburgh, Kan., the center of the southeastern coal field, is $1.50 per ton. The rate on nut coal from Pittsburgh to Kansas City is $1.48 per ton. The sand sells in car lots for 71c per ton net at the plant, while the coal sells in car lots for $6.50 per ton at the mines. This illustrates the general situation in this territory concerning the freight rates on our material and shows that the rates have not been adjusted to bring the proper relation between the commodities and cannot react but to the disadvantage of the construction industry.

John Prince

The largest single factor in halting the construction work laid out for this district, as it has been affected by the supply of mineral aggregate, has been the well known lack of transportation. These materials must of necessity be loaded in open-top cars and the shortage of these materials and the consequent abandonment of a large part of the construction or program in this district has been due to the inability of the industry to secure the necessary open top cars.

The industry feels that it has suffered unnecessarily and unjustly as a result of that part of the Transportation Act of 1920 which placed in the hands of the Interstate Commerce Commission, not only the distribution of open-top cars in the case of emergency but the power to declare without notice, hearing or the making or the filing of a report when such an emergency existed.

The many orders of the Commission which are well known to the Committee resulted in the placing of the principal supply of open-top cars in the country in the hands of the coal mines for the loading of coal without any control exercised on the part of the Commission as to the purpose for which this coal was loaded.

This industry does not wish to place itself in the position of opposing for its own ends a satisfactory supply of fuel for domestic purposes or for essential industries. However, as stated by the general manager's office of a railroad operating in this territory during this past summer, the Santa Fe did not have sufficient equipment (open-top) in this territory to load its own requirements of coal, while about the same date the public press carried the statement that there was 60 miles of coal at seaboard points being held in cars for loading for export.

While the shortage of open-top cars in this district throughout the year has been acute, it has not been uniformly felt by all producers. Producers located at large centers where many coal cars are made empty have in some cases received a fair supply of open-top cars for loading, while at many interior points the producers have been unable to secure even a portion of the supply necessary to provide reasonably uniform or sufficient production to result in economical operation.

This industry is opposed to the principle of placing in the hands of any Commission the power to put out of business by regulation, any essential industries in this country. It is not fair to such industries that priorities giving the use of the transportation facilities of the country be given to the *production* of any commodity unless the priorities are extended to cover the *use* of that commodity. We feel that the height of injustice has been obtained when any non-essential industry in this country could secure, if it could pay the price, an adequate supply of coal at the expense of an industry

as essential to the country as the construction industry.

The Mineral Aggregate Industry of the Missouri Valley therefore calls the attention of the Calder Committee to, and respectfully request their assistance in modifying, the following clauses in the transportation act of 1920:

Section 402, paragraph 12 says in part:

"It shall also be the duty of every carrier by railroad to make just and reasonable distribution of cars for transportation of coal among the coal mines served by it, whether located upon its line or lines customarily dependent upon it for car supply."

We request that either paragraph 12 be stricken out of the act or such obligation with the penalty provided shall apply to the distribution of all open-top cars without referring to a particular commodity such as coal.

With reference to paragraph 15, Section 402, which reads in part:

"Whenever the Commission is of the opinion" that an emergency exists it may "with or without notice, hearing, or making or filing of a report," do certain things among them which is "(a) to suspend the operation of any or all rules, regulations, or practices then established with respect to car service for such time as may be determined by the Commission."

If in the opinion of your Committee, Congress will deem it necessary to provide for an emergency in transportation, then, however, the emergency should be well defined in the act and it should not be possible for an emergency to be set up without a full hearing where all the facts may be presented. If after a hearing it is decided that an emergency does exist, then it should be mandatory upon the Commission to subscribe rules respecting car service that will not place an undue burden on any one industry unless it be when the country is at war or during some actual and well defined national calamity.

Sub-division (d) of this same paragraph (15) reads in part as follows:

"To give directions for preference or priority in transportation embargoes, or movement of traffic under permits at such time and for such periods as it may determine, and to modify, change, suspend, or annul them."

This industry believes that no body of men should have the authority to give priorities in transportation unless in times of war or other emergencies of national scope and we therefore urge that subdivision (d) be stricken out except that part which reads as follows:

"In time of war or threatened war the President may certify to the Commission that it is essential to the national defense and security that certain traffic shall have preference or priority in transportation, and that the Commission shall, under the power herein conferred, direct that such preference or priority be afforded."

In general we believe that the law should be revised in such a way that we will return the principles of non-discrimination as between shippers and commodities at all times which has been the foundation of the transportation rights, enjoyed by all shippers since the passage of the original Act to regulate Commerce in 1887.

Against Government Meddling With Railway Operation

Chamber of Commerce of the United States Takes Definite Stand Against Proposed National Railroad Boards of Labor Adjustment

WASHINGTON.—The creation of National Railroad Boards of Labor Adjustment, as advocated by railroad employes, is opposed in a resolution made public today by the Board of Directors of the Chamber of Commerce of the United States, as not in the public interest.

The transportation Act provides that the carriers and their employes may by agreement establish local, regional or national boards for settlement of all controversies, not directly involving wage disputes. Failure of the roads and their men to agree as to which of the three types should be set up, has resulted in disputes remaining unsettled. The employes are united in advocacy of the creation of national boards. A majority of the carriers are for local boards.

"In the opinion of the board," says the resolution adopted, "the establishment of National Adjustment Boards as desired by representatives of the several organizations of the employes would tend to bring about a state of nationalization of the railroads of the United States, and eventually, to produce the same result in all industries, producing a constantly increasing cost of transportation and production, to the incalculable injury of the public at large and injuriously affecting both the employers and the employes, in the ultimate result.

"The functioning of such National Boards of Labor Adjustment will inevitably lessen efficiency and impair the discipline necessary to the successful operation of the railway systems of the United States under private control, subject to government regulation.

"Such National Boards of Adjustment will effectually prevent open shop operation, under which the employer and the employe may enter into and determine the conditions of employment relations with each other, and thereby impair the successful conduct and full development of the transportation systems in the first instance, and of all industrial establishments when this form of nationalization is extended to them, as will inevitably be extended in case it is established in connection with the railroad systems of the United States.

"The result of the operation of such National Railroad Boards of Labor adjustment will make impossible intelligent and practical co-operation directly between employers and employes, based upon mutual recognition of their community of interest involved in the success of the particular railway or industrial establishment in which they are associated.

"This board is opposed to any procedure which now or hereafter will result in the establishment of National Labor Adjustment Boards as advocated by the representatives of the several organizations of railroad employes."

A report of the Chamber's Railroad Committee, which accompanies the resolution of the Board points out that representatives of organized railroad employes are urging that there is power inherent in the Railroad Labor Board to create National Adjustment Boards, and to endow them with powers national in scope. This position is attacked by the Railroad Committee, which argues that failure to establish such boards by agreement renders nugatory provisions of the Transportation Act making possible their creation. So decidedly are the views of railroad officials and the representatives of organized railroad employes at variance as to the nature of the boards, there is small prospect, says the committee, of their being established by agreement.

A preamble to the resolution adopted by the Board of Directors declares the public interest is involved in that no provision is made for public representation on the proposed adjustment boards. It points out that failure of the carriers and their employes to come to an agreement indicates that the two parties are not making every reasonable effort and are not adopting every available means to avoid interruption of the operation of the roads as was made clearly their duty under the Transportation Act.

Caution Rules Eastern Market for Building Materials

Buyers Want Assurance That Prices Will Not Go Lower and That Deliveries Will Be Made

CAUTIOUS BUYING and inquiries are being met with equally cautious selling terms and promises in the building material and construction markets of the Eastern part of the country, according to the Dow Service Daily Building Reports.

Few building material manufacturers or distributors are taking forward orders at present market price quotations, although within the last ten days there is reported to have developed in certain markets an inquiry from sources believed to represent speculative construction interests. Much of this inquiry which has come through distributors in Philadelphia and New England has been met with reluctant response.

Speculative builders at points somewhat removed from New York and vicinity are watching the developments here closely. New York is the worst sufferer proportionately from the shortage of housing accommodations and lending institutions and private investors in other cities have apparently come to the conclusion that in the light of recent publicity regarding building practice in this city a speculative movement of considerable magnitude may be looked for in and near New York just as soon as it has become apparent that the bottom of the building material price slump has been reached. The idea seems to be that pending the final action of the New York State Legislature upon the remedial measures that the Lockwood Committee will recommend to the law makers small-house and tenement projectors will rush in to take advantage of present building laws and the left over building material and equipment stocks of the 1920 season. The assumption that labor conditions will be less onerous than formerly, at least during the life of the Lockwood inquiry and, incidentally, that during the winter months and early spring labor will be more plentiful is having its influence.

The two essentials, therefore, seems to be, first, to be assured that material prices will at least not react to lower levels; second, assured deliveries into the future. Persistent efforts to bear various markets have met with slight success in the market as a whole either for spot, winter or early spring deliveries. The fact that these inquiries have overflowed to adjacent markets like that of Boston or Philadelphia where water haulage, it was thought, might offset the distance from point of consumption, aroused the interest of speculative builders in these sections who began to wonder where they would come in for supplies if a great New York district demand should suddenly develop without their knowledge, particularly if mill supplies of building materials were low.

Lumber, being the best illustration of the market in the current development offers the best proof of what happened when this movement reached the mill men. One organization reported the receipt of orders in two days amounting to 174 carloads or between three and four million feet, not an exceptional record, but sufficiently important to indicate that something is happening. While the lumber sales company does not admit that this volume of business came from any one section, "but was scattered from Florida to New England and as far west as Ohio," there was sufficient business taken from this vicinity to indicate that there was more than passing probability that there is a change at hand earlier than had heretofore been expected. The instructions the organization sent out to its salesmen read:

> You will have to use some caution in taking orders now, because the stocks on hand are the only ones that we have to sell and we do not want any orders excepting for immediate shipment, and all orders must be taken subject to prior sale. We shall be very glad if you will be as active as possible for the next three weeks, because after that we shall not be active in soliciting business for a month, and we want only enough orders to keep a fair volume of shipments moving during this period.

From a prepared roofing company there went out an order to a salesman accompanying an announcement of final price reduction which said: "By reductions from 24 to 31 per cent, on important items we have sincerely endeavored to attain price level from which further movements should be upward. We can only accept orders for limited quantities in accord with a uniform plan to insure fair and equal opportunity to all our customers." This firm also reports a sharp change in orders and inquiries in its trade.

Basic building materials are holding firm. There are few current price changes.

LABOR CONDITIONS in the rock products industries do not show much evidence of permanent improvement. Big contracts undertaken for next year on the assumption of cheap or plentiful labor are mere gambles, in the opinion of most producers

All-Round New Quarry Enterprise Started in Massachusetts

GROUND was broken November 22 at South Egremont, Bershire County, Mass., for the new half million dollar plant of the Bershire Stone Products Corporation. This is a Massachusetts corporation having a capital stock of $500,000, 8 per cent, preferred, cumulative, and 12,500 shares of common stock of no par value.

The company owns 35 acres of quarry property north of the village of South Egremont and right of way to connect the property with a branch line of the New York, New Haven & Hartford R. R. and with a highway. The stone is described as a highly crystalline blue marble analyzing better than 98 per cent calcium carbonate.

The company proposes to engage in all branches of the limestone quarry business including the production per annum of 100,000 cu. ft. of marble blocks, 8,000 tons of fluxing stone, 6,000 tons of crushed stone, 36,000 bbls. of lime and 30,000 cu. ft. of sawed marble.

The crushed stone it is proposed to use in the manufacture of cast-stone (concrete) or artificial marble. It is expected to begin the quarry operations next spring and to have the entire plant in operation before the end of the coming summer.

The officers and directors of the Corporation are: John MacKenzie Pringle, President; Thomas B. Hamilton, Vice-President and General Manager; G. E. Musselman, Treasurer; E. R. Grabow, John C. Jones, Jr., Attorney and Clerk; Hon. Allen T. Treadway, United States Congressman from Massachusetts, and John B. Hull.

National Crushed Stone Convention at Toronto

IT HAS BEEN unostentatiously announced that the National Crushed Stone Association will hold its annual February convention at Toronto, Ont. The date is February 8, 9 and 10. Mark these in your memo book and make your reservations early.

Secretary Sandles, the editor and others who have had an opportunity to enjoy the hospitality of our Canadian cousins in the crushed-stone industry know that a royal good welcome is waiting and that there will be warmth and good cheer in the meeting in spite of the date and the northern latitude.

In all probability there will be a sectional meeting of agricultural limestone producers. This industry is making great gains in Eastern Canada as in the United States. Secretary Sandles says he is open for suggestions on the program for other parts of the program.

Editorial Comment

It remained for John Prince, chairman of the Missouri Valley Mineral Aggregate Committee, to draw the necessary specifications for freeing the construction industry from the incubus handed it by the Interstate Commerce Commission last June. In his statement before the Calder Investigating Committee of the U. S. Senate at Kansas City, Mo., Mr. Prince has given in clear, brief, and perfectly polite language the specific changes that must be made in the Esch-Cummins railway law to assure the construction industry fair play.

Specifying the Aim

The archives of the Calder Committee is a good place for these specifications, but it is up to the mineral aggregate industry in particular and the construction industry in general to see that Mr. Prince's suggestions do not lie too long in cold storage. Let's all work together to get action on them before another construction season is upon us!

About the time all the railways in the Northwest announce that no more shipments of sand and gravel will be accepted because of the trouble unloading the material in freezing weather, the Interstate Commerce Commission announces that all restrictions on the use of open-top cars are removed. It is also unofficially stated that there are thousands of idle cars.

All You Want Now

We presume that everyone is stocked up with coal enough to last all winter, and except in the South little use will be made of the cars the Interstate Commerce Commission has kindly released for construction work. And there is some agitation in favor of moving all the construction materials possible this winter to be prepared for the spring building boom.

But people who control the purse strings do not yet seem to be convinced of the coming boom and every producer knows the difficulty of cold-weather quarry or gravel pit operation, and every contractor certainly delights to unload cars of frozen material. The thing to move this winter is the spirit of progress and fair dealing on the part of the railways and their government affiliations.

The season of association conventions in the mineral aggregate industries is at hand. Operators generally are just ending what has probably been the toughest season on record, all things considered. It was disappointing from every angle, and those who are able to close their books without a deficit are lucky. And this applies to associations' books as well as individual operators'.

Association Conventions

The situation, however, has its redeeming features, for it demonstrates that there are many problems far too large for the individual operator to hope to cope with and it demonstrates that there is nothing like common problems and common troubles to bring producers together. After all, the keynote of success in association work is *association* — which is almost synonymous with good fellowship and mutual understanding. If this is accomplished the associations can face deficits for 1920 with cheerfulness and confidence that the coming year will wipe them out.

The coming meetings of the various state and national associations of sand, gravel, crushed-stone and crushed-slag producers must face some problems of broad general policy which should call for the most thorough discussion. Among those that are of the utmost importance are, of course, the attitude which shall be assumed in regard to securing a fair share of open-top railway equipment and the procedure for getting lower freight rates on these commodities.

Involved with these matters is naturally the desirability or the undesirability of all the industry working as a unit, or as separate units. Are these national problems or local problems? On the answer to this question hinges the method of attack on probably the biggest problems the industries have ever faced. There is a wide divergence of opinion on this question now, and until there is more unity of opinion there is obviously no field for an amalgamated association of all interests.

There is now a representative national association which has sponsored one line of general policy based on an assumption that these matters of transportation are local issues, and there is one representative association which takes the opposite point of view. It matters little what particular mineral aggregates either one of these associations represents, because any good that one accomplishes in all probability will accrue to the other in the course of time—provided one doesn't counteract the efforts of the other.

There are local associations where assumptions and opinions are just as positive and as divergent. Consequently uniformity of thought and action at this time seems most difficult of accomplishment. Rock Products earnestly hopes to see the atmosphere clear a little as the new construction season approaches, and it earnestly hopes that these coming association meetings will be useful instruments in clearing up these issues. Therefore they should be attended by every producer in the industry, and every producer should go to the meetings prepared to face these issues with the very best thoughts and information.

General Market News

Wolf! Wolf!

Interstate Commerce Commission Releases Vast Amount of Cars for Construction as Winter Season Closes Down

OPEN-TOP cars in sufficient numbers to meet the requirements of construction are assured for the next three months if storage space can be found for the contents of the coal-laden gondolas which are reported to be choking the Lake Ports. When these are unloaded and the strings of empties move inland, contractors may draw deep satisfaction from the great number of cars available. Now that construction is slowing down for winter and little recovery from the disasters of the past season is possible, an abundance of cars may be expected for construction.

As previously suggested in the Special Bulletin of October 30, somebody will probably suggest by January that the entire summer supply of construction material be moved during the next three months in the cars no longer needed for carrying coal. Contractors would then have no complaint when somebody cries "wolf" and during a short period succeeds in jamming a surplus supply of coal into the nation's bunkers and does it at the expense of other vital industries. The number of cars now lying about the terminals and the excess of their tonnage over the market's absorptive power, has not been stated by the producers and distributors of coal.

Judging by the late amendments to Service Order Number 20 of the Interstate Commerce Commission, the spectre of a shivering nation has faded. So much coal has been delivered that the Commission has released about 61 per cent of the equipment affected by priorities. Amendment Number One, by raising the low-side car ruling from 36 to 42 inches, freed about 25,000 cars. Amendment Number Two released all flat-bottom coal cars and nullified priorities over all territory west of the Mississippi River. The total estimate of equipment so far removed from the action of priority rulings is placed by the Commission at 623,000 cars. [Since this was published further restrictions have been removed.]

It begins to look as though now would be a propitious time to inaugurate a program for reasonable distribution of coal during the winter months next year. While the experience of the past four months is still fresh, a sanely drawn plan of distribution might be devised whereby the nation's industries and homes shall receive their fuel. Then should any group of men howl "wolf," the nation can, to speak in the vernacular, let 'em howl their heads off.

After this year's experience with transportation and priorities, contractors need little further evidence to show their need of a solid organization. The triumvirate which handled the coal situation was composed of a government body and two powerful trade associations.

As long as construction companies continue their isolation and fail to coordinate their efforts through a strong association, they may expect to have their rights ignored when those rights conflict with the will of an organized industry.—"The Bulletin of the Associated General Contractors."

[It will be pleasing to mineral aggregate producers to see that by another season at least a powerful organization of contractors will be ready to back up their fight for a fair share of the available transportation service.—Editor.]

Big Developments in Southern Portland Cement Production

DEFINITE ANNOUNCEMENT has been made that ground will probably be broken before the end of this year for the new 1,000,000 barrel per year Portland cement plant of the Lehigh Portland Cement Co. at Birmingham, Ala. Engineers have virtually completed their work and actual construction of the plant will start when forces are released that are now engaged in construction work for the company at other points. These will be transferred to Birmingham. It is also announced by officials of the company that it is hoped to have a part of the plant in operation this year, or at least early in 1921.

The site obtained by the Lehigh Portland Cement Co. includes 250 acres of rich limestone quarry land near what is known as Tarrant City on the outskirts of Birmingham. This will afford raw material in large quantities and of excellent quality. The site alone cost the company about $200,000, it is reported. The plant is to cost about $3,000,000.

The coming of the Lehigh company to Birmingham makes this city one of the country's important centers in the manufacture of cement. During the spring of 1920 the Atlas Cement Co. took over the plant of the Standard Portland Cement Co. at Leeds, near Birmingham, and has been operating it at full force since that time. The National Cement Co. recently took over the long idle plant of the Coosa Portland Cement Co. at Ragland, overhauled it and added improvements, and is now operating it at an annual capacity of 750,000 barrels.

Earlier in the year the Gulf States Portland Cement Co. began operations at Demopolis, Ala., in a plant that had also been idle for some time. The plant was overhauled and enlarged and has since operated at full capacity.

National Agricultural Limestone Association Active

AT A MEETING OF THE EXECUTIVE COMMITTEE of the National Agricultural Limestone Association in Cleveland, Ohio, November 22, plans were discussed for organizing an Ohio, Michigan and Pennsylvania division of the National Association. As decided at the Indianapolis meeting, October 29, the Indiana group of producers will maintain a separate district organization. The Indiana group will hold another meeting to perfect organization on December 16.

It was also decided to hold the annual meeting of the National Agricultural Limestone Association at Columbus, Ohio, Wednesday, January 12, 1921, at 10 a. m. at the offices of the association. A complete reorganization of the association will take place at this meeting.

C. R. Wagner, field representative of the association, stated that a meeting of Missouri agstone producers had been arranged at St. Louis, December 8, 1920, at the offices of the Columbia Quarries Co. Various discussion followed as to the method of supporting a national organization, but no definite agreement was reached.

New York Motor-Truck Show Run Now by Truck Users

NEARLY ALL of the 23,000 sq. ft. available for motor truck exhibits at the Highway Transportation Show to be held in New York City from January 3 to 8, 1921, has been allotted.

The Show, at which the trucks will be exhibited, will be more in the nature of a Highway Transportation Show than a mere motor truck show. For the first time in the history of motor truck exhibitions, the Show will be held by a users' organization instead of a dealers' or manufacturers' association. While the Show will be held by this users' organization, the details of the Show itself will be supervised by a Committee of the Dealers Division of the Motor Truck Association. The personnel of the Show Committee includes A. M. Welch, Reo, chairman; J. A. Innes, Brockway; W. H. Moore, Garford; Paul Campbell, Indiana; R. S. Locke, Federal; W. Lawson, Nash; and E. A. Travis, Locomobile.

Accident Prevention

Safe Use of Hoisting Apparatus

(Prepared for Rock Products by the Engineering Department of the National Safety Council)

THERE IS NOT space here to go into the details of tower construction; the principal essentials are substantial diagonal bracings; ample ties to building or guy wires to the ground, carefully attached and regularly inspected; platforms of ample size and strength, with railings and toe boards, at each level where men must work; a substantial ladder, securely fastened, to extend the entire height of tower; bottom of tower to be planked in or screened in; the tower should be constructed only by experienced man and only such men should take it down afterward.

Protection of Engineer

The engineer operating any hoist or derrick should be protected against falling materials by a plank roof. This, of course, is not necessary if the engine or motor is placed at a considerable distance from the foot of the tower or derrick. Wisconsin regulations require a roof unless the horizontal distance from the hoist to the engineer is at least one-half the vertical height to which the material is hoisted. Cables running from the engine to the hoist should be enclosed or fenced off to prevent injury to workmen who might walk across this space without noticing the cables. Exposed gears on the engine should of course be carefully guarded.

During winter months, a housing around the boiler will give partial protection to the engineer against the cold. This is an important safety measure, as an engineer with numb hands cannot control his throttle and brakes properly nor act quickly in an emergency. Exhaust steam pipes should discharge so as not to obstruct the view of the engineer.

Signals

The misunderstanding of signals is one of the greatest causes of accidents on all kinds of hoisting apparatus. The fact that a signal may be misunderstood is one strong reason against permitting men to ride on hoists.

Whistle signals are liable to be confused with other noises, and are not recommended. Hand signals are satisfactory where the engineer can always easily see the signal man. A mechanical bell at the engine, operated by pulling a wire, is fairly satisfactory if the wire does not have to be too long nor run around corners; only wire of ample strength should be used and it should be carefully protected against fouling, by being enclosed in a pipe or otherwise guarded where exposed to injury.

Because of the hazards connected with whistle, hand, or mechanical bell signals, many construction men recommend the use of an electrical bell, or in some cases, a telephone.

Where the engineer cannot see the hoist, it is advisable to mark the cable to indicate the position of hoist at every landing. This affords a check on the signal system and reduces the chances of accident due to a misunderstanding of signals.

Brakes

It is essential that brakes be absolutely reliable because of the hazard to the building and to workmen should any part of the apparatus fall. Brakes should be tested frequently and inspected daily to make sure that they are always in condition to hold the maximum load. A dog or pawl should be provided to hold the load when it is to be suspended for any considerable time as the brake should not be depended upon for this purpose.

Cables

The cable should be securely fastened to the drum either by zinc plugs or by suitable clamps and at least two full turns of the cable should remain on the winding drum at all times.

The Operator

The operator or hoisting engineer has great responsibility in the handling of a hoist or derrick and should be a man thoroughly familiar with the apparatus and reliable in every respect. No person given to chance-taking, or inclined to let his attention be drawn from the work, should ever be permitted to operate hoisting apparatus.

Inspection

A careful inspection should be regularly made of all bolted and nailed joints, hoisting cables and guy wires and their fastenings, platforms, railings, and toe boards. The hoisting engineer is probably the best man to make this inspection if he has the time; if not, some one else should be instructed to make such inspection, at regular intervals.

Platform Elevators

Platform elevators used for hoisting brick and other materials in wheelbarrows or trucks present many of the hazards of permanent freight elevators. If the elevator is located inside the building, the opening at each floor should be guarded with a railing and toe board. A solid, slatted, or wire mesh enclosure six feet high (some laws require eight feet) is better. On the open side, a bar gate at least should be provided to prevent the watchman or other person from walking into the opening when the elevator is not in use. It is best to place bar gates two feet from openings. A wooden or heavy wire mesh cover over the top of the car is advisable to protect men loading the car at the bottom from being struck by objects which may fall from the upper floors.

If men are permitted to ride on the elevator, many other safeguards, such as are found on permanent freight elevators, should be provided. As these safeguards are practically never provided on construction hoists, men should be positively forbidden to ride on them and to make this rule effective, it should be scrupulously obeyed by the superintendents and foremen themselves.

(To be concluded)

Last Call for the 1921 Safety Calendar

OVER 125,000 of the 1921 Safety Calendars have been sold to date. This would indicate that the demand for the Calendar this year will greatly exceed that of any preceding year.

THIS Calendar offers a splendid opportunity to round out safety instructions given to the man in the shop by carrying the message into his home, to his wife, and to his children, and through them, back to him.

IF you have not ordered your supply of this splendid Calendar—send your order at once.

IF you haven't seen a copy—write for one. It will be sent without obligation.

SHIPMENTS will be made as promptly as possible, but we cannot provide against transportation delays which occur at this season.

National Safety Council
Co-operative—Non-commercial
168 N. Michigan Ave. Chicago, Ill.

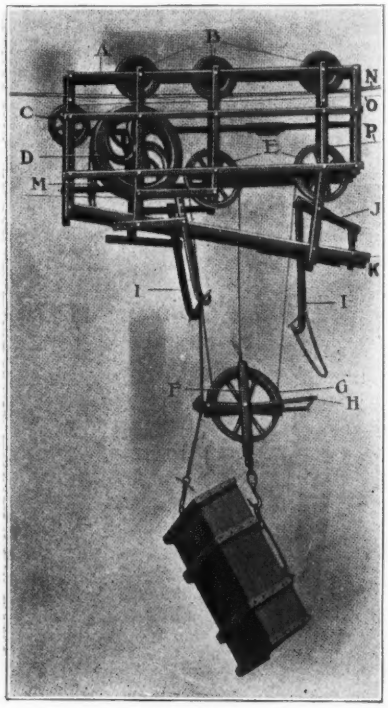
New Machinery and Equipment

Cableway Carrier Used in Slate Quarries

A DEVICE which appears to be part of the standard equipment for slate quarries in New York and Vermont is the Ruggles aerial carrier, made by the Ruggles Machine Co., Poultney, Vt. This carrier has also been used to some extent in limestone quarries in this locality, and it appears to have quite a wide application.

The operation of the cableway is described as follows:

The dumping hooks, or chains, are arranged by the men in the pit for dumping either in the air or lowering the load to the ground as desired. The engineer is signalled to start, and the load is drawn up to the cable until the fall block "F" strikes the lever "K" and lifts the free end of same until the carrier is unlocked, thus releasing the friction on the brake wheel "D," and by the continuous winding of the draw rope upon the drum the carrier and its load will move along up the cable or, slackening, if the load is to run down hill, until it arrives at the desired destination, when the carrier is stopped. The draw rope is then slackened and the load lowered (if to be dumped in the air) until the dumping bar on the fall block "F" catches the dumping hooks "L" on the carrier, which will cause the box to tip, or the chain to unhook if it is a hoist. If the load is to be lowered to the ground the dumping bar on the fall block referred to is unfastened by the men in the pit, while if the load is a stone hoist and intended to be dumped in the air, the dumping bar is attached to the chain surrounding the hoist, but if it is intended to be lowered to the ground, the dumping bar is left off; thus the disposition of the loads, whether to be lowered to the ground or to be dumped in the air, is arranged by the men in the pit. The engineer needs no signal other than to start the load.



Carrier with the down-hill attachment in a locked position

A—Frame. BBB—Cable sheaves. C—Detaining sheave (over which the detaining rope runs from the mast, over brake wheel D to the dead-log). D—Brake wheel. EE—Draw rope sheave (showing draw rope P, end fastened to top of fall block F). F—Fall block, or bill wheel. G—Fall block sheave. H—Shifting bar. I—Shifting bar hook. J—Shifting bar lever. K—Brake lever. L—Dumping hooks. M—Turnbuckles (connecting brake band with brake lever K). N—Cable. O—Detaining rope. P—Draw rope.

Advantages claimed for this device include: The carrier needs but one rope to connect it with the engine drum. The engine can be set at any convenient place in relation to the cable, and at any distance from the mast, so that the engine would not have to be disturbed if ever found necessary to move the cable. As the quarry is worked out, or the dumping ground is filled up, the cable must be moved sooner or later. The incline cable system does not require a special engine to run the carrier. The carrier works automatically and can be operated by a single drum engine and a single operator. One three-drum engine handled by one engineer will operate three carriers. This type of carrier can be run faster and thereby do more work, and when dumping space is filled it is only necessary to move the cable to start another dump. There is no expensive tower to move.

Underwater Storage of Bituminous Coal

IT IS WELL KNOWN that bituminous coal stored in the open deteriorates very appreciably, and this is one factor which has prevented many large users of coal from accumulating stocks for future use. There is also of course a certain fire hazard in coal stored in the open air.

Under-water storage of coal on the other hand preserves all the heating value and entirely eliminates the fire hazard. Coal that is saturated with water also makes a better fire for most purposes than dry coal. This is particularly true of lime kiln operation, where the best re-

Sauerman bucket on coal

sults with coal-fired furnaces are had when the maximum gassifying effect of the coal is obtained.

Where coal is to be dried and pulverized as for use in rotary kilns for lime and cement manufacture it is of course possible that the cost of driving off the additional moisture will more than offset the gain in the prevention of deterioration by under-water storage.

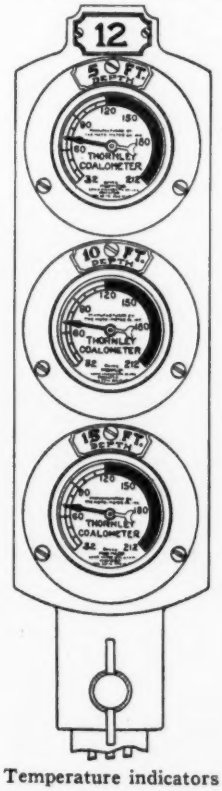
The illustration herewith shows an extremely simple underwater coal-storage and coal-handling system applicable to any lime plant. The coal is received on the concrete trestle on the right of the picture and dumped into a rectangular pit to the left. The pit is concrete lined and is kept sufficiently filled with water to submerge the coal it contains.

The coal is recovered from this pit by a Sauerman bottomless power scraper, installed by Sauerman Bros., Chicago, Ill., and conveyed by the same means to a dumping hopper which feeds a bucket elevator to the plant bins.

Device for Indicating Temperatures in Stored Coal

AS IS WELL KNOWN, bituminous coal has the property of spontaneous combustion in certain spots and at varying depths. This heating does not always cause actual combustion, in the sense that coal burns with the presence of flame, though this condition is also often encountered. There does exist almost universally, however, in stored coal of this character a slow combustion, which is even more destructive than combustion by flame, owing to the fact that it cannot be so readily detected, and thus accomplishes its destructive heating, quietly and unnoticed, throughout an ever-increasing zone, beneath the surface of stored coal. This slower escape of the valuable B.t.u.'s, for which the consumer pays his money, is equivalent to the actual loss of that amount of heating value from fire or other cause.

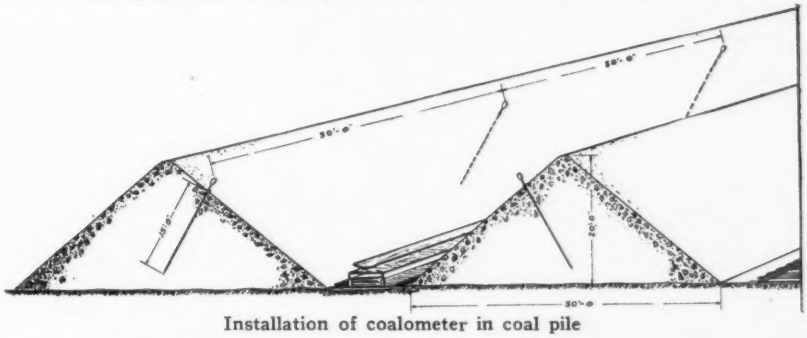
It is for the purpose of indicating these conditions beneath the surface that the Thornley Coalometer was designed by F. C. Thornley & Co., Inc., constructing and consulting engineers, 31 West 43d Street, New York City. It consists of a set of temperature indicators encased in a long, pointed steel tube, carrying at varying depths metal bulbs (corresponding to the bulbs of thermometers), and at its upper end a set of indicating dials which show the exact temperatures of the bulbs which actuate them. These units are forced down into the coal pile to definite depths and at various points, and collectively furnish definite data to the consumer as to the exact temperature existing beneath the surface. If an accurate record of these instruments be kept, periodically, the slightest rise in temperature is at once detected, and should it become excessive the consumer at once removes this particular portion of fuel, thus saving the heating value of the coal which had started to dissipate. These instruments are enclosed in weather-tight metal cases with thick crystal faces and the set is mounted in a cast metal case, thus forming one unit.



Temperature indicators

The indicators themselves are especially constructed to show exact bulb temperatures, regardless of the temperature of the instrument head. They will withstand excessive vibration without damage or loss of calibration. They have been passed by the U. S. Bureau of Standards and the Bureau of Steam Engineering.

The cut shows a triple unit Thornley Coalometer for use in coal piles from 15 to 20 feet deep. A galvanized steel tube, having a hardened point at its lower end, carries three bulbs at depths of 5, 10 and 15 feet, respectively. These three bulbs register temperatures in Fahrenheit degrees upon three dials. The scale on each dial starts at 32 degrees F., and is colored black. At and above 120 degrees the scale is red, indicating excessive heat at any point in this zone, and warning the coal man to remove this portion of the coal. The depth of the hot spot is determined at a glance, for the dials are plainly marked 5, 10 and 15 feet, respectively. The dial showing the hottest temperature thus indicates the depth at which the heat is generating.


Installation of coalometer in coal pile

Electrically-Operated Shovels

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO., East Pittsburgh, Penn., has recently issued Circular No. 7132 on the "Electrification of Excavating Shovels," which will be of interest to rock products producers.

This bulletin recalls the history of the electric shovel, dating from 1908, when the first shovels of any size were built to operate with direct-current motors. The first alternating-current motor shovel, equipped by the Westinghouse company, was built for a quarry operator in 1909.

Large orders have recently been placed with this company for electrically operated shovels for mining work.

The bulletin describes the method of electrification in detail. There are four general methods: (A) Using direct-current motor equipment with rheostatic control, low-voltage, direct-current power being supplied through flexible cables; (B) direct-current motor equipment, low voltage power being supplied by motor generator or rotaries located on the shovels and operated by high voltage alternating current power through flexible cables; (C) Two or three phase alternating current motors with rheostatic control, low-voltage alternating current being supplied by flexible cables; (D) The same as (C) but with the current supplied at high voltage and stepped down by a transformer on the shovel. This last is recommended as the best for large operations.

Various views are given of electric shovel installations, and recent cost data on their operation is included.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:			1.40 per net ton, all sizes			
Buffalo, N. Y.						
Burlington, Vt.	1.00		2.50	2.00	2.00	
Califon, N. J.	1.80	2.25	2.00	1.80	1.80	
Chaumont, N. Y.	1.75	1.75	1.75	1.50	1.50	1.50
Coldwater, N. Y.	1.80	1.80	1.80	1.65	1.65	2.00@2.25‖
Grove, Md.	1.45	2.50	2.40	2.00	1.60	1.45
North Leroy and Akron, N. Y.	1.25	1.25	1.25	1.25	1.25	1.25
Redington, Pa. (dolomite)	1.35	1.35	1.85	1.85	1.85	1.85
Utica, N. Y.	1.00		All other sizes 1.50			
Vernoy, N. J.	2.00	2.25	2.00	1.80	1.60	
CENTRAL						
Alden, Ia.	1.00		1.50	1.45	1.45	
Alton, Ill.	2.50		2.00	2.00	1.75	
Bettendorf, Ia.			All sizes, 1.75 cu. yd.			
Buffalo, Ia.		1.35	1.45	1.25	1.25	1.35
Chicago, Ill.	1.58	1.90	1.70	1.58	1.58	1.58
Cincinnati, Ohio		2.00	2.00	2.00		
Cleveland, Ohio		2.40	2.20	2.20		
Columbia, Ill.	2.15	1.90	2.00	2.00	1.90	1.90
Coralville, Ia.	1.25	1.60	1.55	1.50	1.40	
Davenport, Ia.	1.50*	1.50*	1.50*	1.50*		
Dundas, Ont.	.75	1.50	1.50	1.35	1.25	1.20
Eden and Knowles, Wis.	1.30	1.30	1.30	1.30	1.30	
Ft. Wayne, Ind.	1.60	1.90	1.90	1.80	1.60	1.60
Greencastle, Ind.	1.25@1.50	1.35	1.25	1.10@1.20	1.10	1.10
Illinois, Southern	2.25	1.75	1.75	1.75	1.50	
Kansas City, Mo.	.60	2.00				
Kokomo, Ind.	1.10	1.10	1.25	1.20	1.10	1.10
Krause or Columbia, Ill.	1.80	1.30	1.50	1.40	1.30	1.30
Lannon, Wis.	1.25	1.25	1.25	1.25	1.25	1.25
Lima, Ohio	1.70	1.60	1.50	1.50	1.50	1.50
Linwood, Ia.	1.00		1.45	1.25	1.25	
Mansfield, Ohio	1.70	2.20	2.00	1.90	1.70	1.70
Mayville, Wis.	.95@1.00		1.20	1.20	1.20	1.20
Montrose, Ia.	1.25	1.75	1.75	1.65	1.65	1.65
Oshkosh, Wis.			1.40 per ton, all sizes			
Ottawa, Can.	3.00	3.25	3.40	2.75	2.50	
River Rouge, Mich.	1.25	1.50	1.50	1.50	1.25	1.25
St. Louis, Mo.	.60	1.60				
Sheboygan, Wis.	1.30	1.30	1.30	1.30	1.30	1.30
Stone City, Ia.	.80		1.65	1.55	1.45	
Toledo, Ohio, f. o. b. cars	1.85	2.10	2.10	2.10	1.85	1.85
Toronto, Canada	1.75	2.40	2.40	2.40	2.15	2.15
Winnipeg, Can.	2.90*		3.25*	2.90*		
SOUTHERN:			These prices include 90c freight			
Cartersville, Ga.	2.50	2.50	2.50	2.50	2.50	2.50
Chickamauga, Tenn.	1.50	1.75	1.75	1.75	1.75	1.75
Columbia, S. C.	1.00@1.25	3.50	3.50	3.50		
El Paso, Tex.	1.00	1.00	1.00	1.00		
Fort Springs, W. Va.	1.85	2.00	2.00	1.85	1.65	1.50
Garnett, Okla.	.65		1.75	1.75	1.60	
Mascot, Tenn.		1.50	2.00		1.50@2.00	
New Braunfels, Tex.	.60	1.75	1.75	1.50	1.50	1.50
WESTERN:						
Atchison, Kans.	.50		2.10	2.10	2.10	
Blue Springs and Wymore, Neb.	.20	1.95	1.95	1.85@1.90	1.75@1.80	1.70
Kansas City, Mo.	.60	2.00				
Duluth, Minn.	1.00	2.25	2.00	1.50	1.50	1.50

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Bernardsville, N. J.	2.00	2.20	2.00	1.80	1.50	
Branford, Conn.	.80	1.75	1.65	1.45	1.25	
Birdsboro, Pa.	1.40	1.90	1.80	1.60	1.40	1.40
Bound Brook, N. J.	2.10	2.30	2.00	1.85	1.70	
Dresser Jct., Wis.	.75	2.45	2.45	2.15	2.00	2.00
Duluth, Minn.	1.00	2.50	2.00	1.50	1.50	1.50
E. Summit, N. J.	2.10	2.35	2.15	1.85	1.80	
Glen Mills and Rock Hill, Pa.	1.60	1.90	1.90	2.25	2.10	1.90‖
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60@1.00	1.60@1.80	1.60@1.80	1.40@1.50	1.20@1.30	
Oakland, Calif.	1.15	1.15	1.15	1.15	1.15	1.15
San Diego, Calif.	.50@ .70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	
Westfield, Mass.	.60	1.35	1.30	1.20	1.10	
Winchester, Mass.	.85	.85	.85	2.10	1.85	1.60

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Dundas, Ont.—Flint	1.10	1.10	1.10	1.10	1.10	1.10
Hendlers, Pa.—Quartzite	.90	.90	1.20	1.45	1.35	1.10
Holton, and Bolingbroke, Ga.—Granite	.40		2.75	2.50	2.25	2.25
Little Falls, N. Y.—Syenite	.90	1.30	1.30	1.50	1.40	1.30
Middlebrook, Mo.—Granite	4.00		2.00	2.00		1.50‡
Ottawa, Can.—Granite	5.50	5.00	5.50	5.00		
Stockbridge, Ga.—Granite	.50	2.00	1.90	1.75	1.75	
White Haven, Pa.—Sandstone	1.20	1.70	1.70	2.00	1.85	1.70

*Cubic yard. †Agrl. lime. ‖R. R. ballast. §Flux. ‡Rip-rap. a 3-inch and less.

Agricultural Limestone

EASTERN:

Coldwater, N. Y.—Analysis, 56.77% $CaCo_3$, 41.74% $MgCo_3$—70% thru 200-mesh, 95% thru 40-mesh; bags, $5.00; bulk — 3.25

Chaumont, N. Y.—Analysis: $CaCo_3$, 92 to 98%; $MgCo_3$, 1.51%—(Thru 100 mesh); sacks, 4.50; bulk — 2.75

Gasport, N. Y.—90% thru 50 mesh, bulk, 2.50; bags — 4.25

Grove City, Pa.—Analysis: $CaCo_3$, 94.75%; $MgCo_3$, 1.20%—(70% thru 100 mesh); 80 lb. ppr., 5.50; bulk — 4.50

Grove, Md.—(50% thru 50 mesh); paper bags, 6.50; bulk — 4.50

Hillsville, Pa.—Analysis, $CaCo_3$, 96% (70% thru 100 mesh); sacks, 5.00; bulk — 3.25

Jamesville, N. Y.—Analysis, $CaCo_3$, 89.25%; $MgCo_3$, 5.25%; bulk, 2.75; sacks — 4.50

Syracuse, N. Y.—Analysis, 90% carbonates (50% thru 100 mesh, 90% thru 50 mesh); sacks, 3.50; bulk — 2.75

Walford, Pa. (50% thru 100 mesh; 60% thru 50; 100% thru 10); sacked, 5.00; bulk — 3.25

West Stockbridge, Mass.—Analysis: Combined carbonate, 95%—33% thru 200 mesh; 66% thru 100; 100% thru 40. Bulk — 2.85

Williamsport, Pa.—Analysis, $CaCo_3$, 88-90%; $MgCo_3$, 3-4%—(50% thru 50 mesh); bulk — 4.00@5.50

CENTRAL:

Alden, Ia.—Analysis, $CaCo_3$, 99.16% — .80

Alton, Ill.—Analysis: $CaCo_3$, 96%; $MgCo_3$, 0.75%—90% thru 100 mesh — 9.00

Bedford, Ind.—(90% thru 10 mesh) Analysis, $CaCo_3$, equivalent 98.5% — 2.00

Belleville, Ont.—Analysis, $CaCo_3$, 90.9%; $MgCo_3$, 1.15% (45 to 50% thru 100 mesh; 61 to 70% thru 50 mesh); bulk — 2.50

Chicago, Ill.—Analysis, $CaCo_3$, 53.63%; $MgCo_3$, 37.51%—90% thru 50 mesh — 1.50

Columbia, Ill., near East St. Louis (½-in. down) — 1.25@1.80

Elmhurst, Ill.—(Analysis, $CaCo_3$, 35.73%; $MgCo_3$, 20.69%) 50% thru 50 mesh — 1.25

Greencastle, Ind.—(Analysis $CaCo_3$, 98%), 50% thru 50 mesh — 2.00

Howenstein, O.—100% thru 10 mesh; 59% thru 50; 39% thru 100 — 2.75@3.00

Lannon, Wis.—(90% thru 50 mesh) Analysis, 54%, $CaCo_3$; 44%, $MgCo_3$ — 2.00

Marblehead, O.—(Analysis: $CaCo_3$, 95.33%) 100% thru 100 mesh, sacks, 5.25; bulk — 3.00

Mayville, Wis.—$CaCo_3$, 53.65%; $MgCo_3$, 43.72% — 1.75@2.00

McCook, Ill.—Analysis, $CaCo_3$, 54.10%; $MgCo_3$, 45.04%—100% thru ¼-in. sieve; 78.12% thru No. 10; 53.29% thru No. 20; 38.14% thru No. 30; 34.86% thru No. 50; 22% thru 100 — 1.50

Milltown, Ind.—(Analysis, $CaCo_3$, 94.41%; $MgCo_3$, 2.95%); 28% thru 100 mesh; 25.2% thru 200 mesh; 34.4% thru 50 mesh — 1.65

Montrose, Ia.—(90% thru 100 mesh) — 1.25

Piqua, O.—Analysis: $CaCo_3$, 82.8%; $MgCo_3$, 8.2%; neutralizing power in terms of calcium carbonate, 95.3%—50% thru 100 mesh — 3.50@5.50; 50% thru 50 mesh — 1.75@2.00

Ridgeville, Ind.—(Analysis $CaCo_3$, 98%), 100% thru 4 mesh — 1.75

River Rouge, Mich.—Analysis: $CaCo_3$, 54%; $MgCo_3$, 40%; bulk — .80@1.40

Stolle, Ill. (near East St. Louis on I. C. R. R.)—(Thru ¼-in. mesh) Analysis, $CaCo_3$, 89.61 to 89.91%; $MgCo_3$, 3.82% — 2.25

St. Paul, Ind.—Analysis, $CaCo_3$, 85%; $MgCo_3$, 12% — 1.50

Stone City, Ia.—Analysis, $CaCo_3$, 98% (50% thru 100 mesh) — .80

Toledo, O.—Analysis, $CaCo_3$, 52.72%; $MgCo_3$, 43%—(20% thru 100 mesh); 30% thru 50; 80% thru 100; 100% thru 5/32 screen) — 1.80

Whitehill, Ill.—Analysis, $CaCo_3$, 97.12%; $MgCo_3$, 2.50%—50% thru 100 mesh — 5.00; 50% thru 50 mesh — 2.25

(Continued on next page.)

Agricultural Limestone

(Continued from preceding page.)

SOUTHERN:

Cartersville, Ga.—Analysis: 96% combined carbonates—90% thru 100 mesh 3.00

Claremont, Va. (Marlime)—Analysis, 90.94% $CaCo_3$, 0.31% P., 1.36% Mg., 0.37% K.; bulk 4.50
100 lb. ppr. bags 6.00
100 lb. cloth bags 6.50

Dittlinger, Tex.—Analysis, $CaCo_3$, 99.09%; $MgCo_3$, .04%—
90% thru 100 mesh 2.00
90% thru 4 mesh 1.00

Grovania, Ga.—Analysis, $CaCo_3$, 95%; $MgCo_3$, none—50% thru 100 mesh 3.00

Hopkinsville, Ky.—Analysis, 94.6 to 98.1% $CaCo_3$—Bulk 2.00

Knoxville, Tenn.—Pulverized 2.50
90% thru 100 mesh 3.00

Linnville Falls, N. C.—Analysis, $CaCo_3$, 53%; $MgCo_3$, 42%—50% thru 100 mesh; sacks, 4.50; bulk 3.00

Marion, Va.—Analysis, 90% $CaCo_3$—(50% thru 100 mesh) 2.50

Memphis Jct., Ky.—(Analysis, $CaCo_3$, 95.31%; $MgCo_3$, 1.12%); average price, ½ in. down 2.00

Mascot, Tenn.—Analysis, $CaCo_3$, 52%; $MgCo_3$, 38%.
(80% thru 100 mesh) 3.00
(All thru 10 mesh) 2.50
(80% thru 200 mesh) 5.00
Paper bags, $1.50 extra per ton; burlap, 2.00 extra per ton.

Maxwell, Va. 2.50

Mountville, Va.—Analysis, $CaCo_3$, 76.6%; $MgCo_3$, 22.83%—50% thru 100 mesh; 100 lb. ppr., 7.00; bulk .. 5.00

Ocala, Fla.—Analysis, $CaCo_3$, 98%—(75% thru 200 mesh) 4.50

Tyrone, Ky.—Analysis, $CaCo_3$, 90%; $MgCo_3$, 4%—90% thru 4 mesh ..... 1.75@2.25

WESTERN:

Cement, Calif.—Analysis, $CaCo_3$, 95%; $MgCo_3$, 2%—(50% thru 50 mesh) 5.00

Colton, Calif.—Analysis: $CaCo_3$, 95%; $MgCo_3$, 1½% (all to pass 14 mesh)—bulk, 3.50; bags 4.50
Sacks, 15c extra, returnable.

Kansas City, Mo., Corrigan Sid'g—50% thru 50 mesh; bulk 2.00

Oro Grande, Calif.—Analysis: $CaCo_3$, 94%; $MgCo_3$, 2%; 85% thru 200 mesh; $4.00, bulk; bags 10.25

Terminus, Calif.—Analysis, 96.4% $CaCo_3$, 1.3% $MgCo_3$—(60% thru 200 mesh; 80% thru 100 mesh; 100% thru 50 mesh); sacks, 6.00; bulk 5.25

Tulsa, Okla.—90% thru 4 mesh ..... .65

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:

Berkeley Springs, W. Va. ..... 3.00@3.50
Bridgeton, N. J.—Washed, 2.50; dried 3.00
Cedarville and South Vineland, N. J.—Damp, 2.00; dry 2.50
Columbus, Ohio ..... 2.50@3.00
Gray Summit, Mo. ..... 2.50@4.00
Hancock, Md.—Damp 2.00
Klondike and Pacific, Mo. ..... 2.50@4.00
Leesburg, Pa.—Core, and molding coarse 3.00
Mapleton, Pa.—Dry 4.00
Glass, damp 3.00
Massillon, Ohio 3.50
Millington, Ill. ..... 2.25@3.00
Mineral Ridge, Ohio 4.00
Montoursville, Pa.—Green, washed ..... 2.00@2.75
Morgantown, W. Va. ..... 3.00@3.25
Oregon, Ill.—Large contracts ..... 2.00@2.50
Ottawa, Ill. 2.50
Pittsburgh, Pa.—Dry, 4.00; damp 3.00
Robinson, Md.—Washed, damp 2.00
Rockwood, Mich. ..... 3.00@4.00
Round Top, Md.—Glass and damp, $2.50; core 2.25
St. Marys, Pa.—Green 3.00
Sands, Elk Co., Pa.—Selected, green .. 2.75
Thayers, W. Va.—Washed 3.00
Tygarty, Ky.—Washed, not dried 2.60
Utica, Ill. ..... 1.75@2.50

FOUNDRY SAND:

Albany, N. Y.—
Molding, fine and coarse ..... 3.00@3.50
Brass molding ..... 3.00@4.00
Core 2.00
Sand blast ..... 6.00@8.00
Allentown, Pa.—Core ..... 1.50@1.75
Molding coarse ..... 1.50@1.75
Arenzville, Ill.—Molding fine ..... 1.80@2.25
Beach City, Ohio—Core ..... 3.00@3.50
Furnace lining ..... 3.50@4.00
Molding fine and coarse ..... 3.00@3.50
Sand blast ..... 3.50@4.00

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Ambridge, South Heights, Pa.	.....	**1.30**	.....	**1.30**	**1.00**	**1.00**
Attica, N. Y.	**.75**	**.75**	**.75**	**1.00**	**1.00**	**1.00**
Erie, Pa.	.....	1.00	1.15	.....	1.25	.....
Farmingdale, N. J.	.48	.48	.....	.....	1.40	.....
Hartford, Conn.	**.90**	.....	1.25	1.15	1.15	1.15
Leeds Junction, Me.	.....	.60@ .75	2.00	1.75	1.65	1.50
Ludlow, Mass.	**.75***	**.75***	**1.70**	.....	**1.50***	**1.50***
Pittsburgh, Pa.	.....	1.30	1.30	.....	1.00	.....
Washington, D. C.	**.75**	**.75**	**2.00**	**1.40**	**1.20**	**1.20**
York, Pa.	.....	1.10@1.30	(crushed gravel)			
CENTRAL:						
Alton, Ill.	**.60@ .75**	**.60@ .75**	**1.50@4.50**	**1.30**	**1.20**	**1.20**
Attica and Covington, Ind.	1.00	1.00	1.00	1.25	1.25	1.25
Barton, Wis.	.70	.70	.....	.80	.....	.80
Chicago, Ill.	.....	1.75@2.23	1.75@2.43	.....	.....	.....
Cincinnati, O., and vicinity	1.20	1.15	1.15	1.15	1.15	2.00
Columbus, O.	.....	.70@1.25	1.00@1.25	.80@1.25	.80@1.25	.70@1.25
Des Moines, Ia.	**1.00**	**.75**	**1.65**	**1.65**	**1.65**	**1.65**
Detroit, Mich.	.....	.70	.....	.85 (64/40)	.....	.95
Earlestead (Flint), Mich.	**.60**	**.70**	.....	**1.05**	**.95**	**.95**
Eau Claire, Wis.	.60	.60	1.35	.....	1.10	.....
Elkhart Lake, Wis.	**.75**	**.60**	**1.00**	**.84**	**.84**	**.84**
Grand Rapids, Mich.	.....	.60	.....	.90	.85	.85
Greenville, Mechanicsburg, O.	**.80**	**.70**	**.80**	**1.00**	**.85**	**.80**
Humboldt, Ia.	**1.00**	**.85**	**1.90**	**1.90**	**1.90**	**1.90**
Indianapolis, Ind.	**.60**	**.60**	.....	**1.50**	**.75**	**.75**
Janesville, Wis.	.....	.80	.....	.....	.90	.....
Lincoln, Neb.	Sand .80, sand and gravel 1.30, drained for shipment					
Mason City, Ia.	**1.00**	**.90**	**2.00**	**1.85**	**1.85**	**1.75**
Milwaukee, Wis.	1.55	1.55	1.60	1.60	1.60	1.60
Minneapolis, Minn.	.50	.50	2.00	2.00	1.75	1.50
Pittsburgh, Pa.	.....	1.30	1.30	.....	1.00	1.00
Riton, Wis.	.....	.85	.....	.....	.....	.85@1.00
Saginaw, Mich., f. o. b. cars	**1.30**	**1.30**	**2.20**	**1.95**	**1.85**	**1.85**
St. Louis, Mo., f. o. b. cars	1.95	1.65	1.85	1.65	1.60	1.60
Summit Grove, Clinton, Ind.	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**
Terre Haute, Ind.	1.00	1.00	1.25	1.25	1.25	1.25
Toledo, Ohio	**.75**	**.75**	.....	.....	.....	.....
Winnipeg, Can.	.....	.....	All sizes 1.20			
Yorkville, Moronts, Oregon and Sheridan, Ill.	.90@1.00	.90@1.00	.90@1.00	.90@1.00	.90@1.00	.90@1.00
SOUTHERN:						
Flomaton, Ala.	.....	1.00	.....	2.25	.....	.....
Ft. Worth, Tex.	2.00@2.25*	2.00@2.25*	2.75@3.00*	2.75@3.00*	2.75@3.00*	.....
Jedburg, Mo.	.....	1.05	1.20@1.45	1.00	1.00	.95
Knoxville, Tenn.	**1.25**	**1.25**	**1.65**	**1.65**	**1.65**	**1.50**
Lake Weir, Fla.	.....	**.75**	.....	.....	.....	.....
Macon, Ga.	.....	.75@1.00	.....	.....	.....	.....
Memphis, Tenn.	**1.40**	**1.40**	**1.50**	.....	.....	**1.50**
N. Martinsville, W. Va.	.....	**1.40**	.....	.....	.....	**1.20**
New Orleans, La.	1.00	.....	1.75	.....	.....	.....
Pelzer, S. C.	**.90**	.....	.....	.....	.....	.....
Pine Bluff, Ark.	1.25	.92	Washed gravel, all sizes, 2.10			
Tulsa, Okla.	.....	**.70**	.....	.....	.....	.....
Waco, Texas	**.70@ .80**	**.70@ .80**	.....	.....	.....	**1.10**
WESTERN:						
Grand Rapids, Wyo.	**.50**	**.50**	**.85**	**.85**	**.80**	**.80**
Kansas City, Mo.	(Kaw River sand, car lots, .75 per ton, Missouri River, .85)					
Niles, Calif.	**1.00**	**1.00**	**.90@1.10**	**.85@1.00**	**.85@1.00**	**.85@1.00**
Porteau, B. C.	1.30	1.30	1.30	.....	.....	1.20
Pueblo, Colo.	.95	.90	.....	.....	.....	2.00
Roseburg, Ore.	2.00	1.75	2.00	1.75	1.75	1.75
San Diego, Calif.	.80@1.00	.80@1.00	1.30@1.60	1.25@1.55	1.25@1.45	1.10@1.40
San Francisco, Calif.	.....	**1.00**	**1.00@1.20**	**.85@1.00**	**.85@1.00**	**.85@1.00**
Saratoga, San Jose, Calif.	.....	**.60@ .75**	**.60@ .70**	**.60@ .70**	**.60@ .70**	**.60@ .70**
Seattle, Wash.	1.25	1.25	2.00	1.25	1.25	1.25
Vancouver, B. C.	.....	**1.30***	.....	**1.30***	.....	**1.20***

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Boonville, N. Y.	.60@ .80	.....	.55@ .75	.....	.....	1.00
Glenville, N. Y.	.....	.....	.....	1.00*	.....	.....
Hartford, Conn.	.....	1.00*	.....	.....	.....	.....
Yardville, N. J.	.....	**.50@ .75**	.....	.....	.....	.....
York, Pa.	.....	1.00@1.30		(crushed rock sand)		
CENTRAL:						
Attica, Covington, Silverwood, Ind., and Palestine, Ill.	**.85**	**.85**	**.85**	**.85**	**.85**	**.85**
Cherokee, Hawarden, Ia.	.80 per ton—1.20 washed					
Elkhart Lake, Wis.	.90 per ton (washed concrete material)					
Ft. Jefferson, Mechanicsb'g, O.	**.70**	**.60**	**.60**	.....	.....	.....
Hersey, Mich.	**.60**	.....	.....	**.60**	**.60**	.....
Janesville, Wis.	.....	**.65**	.....	.....	**.75**	.....
Lincoln, Neb.	.....	.....	Sand gravel mix, 1.30			
Oxford, Mich.	.....	.....	.....	.....	.....	.85@ .95
Saginaw, Mich., f. o. b. cars	.....	.75	1.30	1.30	1.30	1.30
St. Louis, Mo., f. o. b. cars	.....	.....	.....	.....	.....	1.75
Summit Grove, Ind.	**.65**	**.65**	**.65**	**.65**	**.65**	**.65**
Yorkville, Oregon, Moronts and Sheridan, Ill.	.....	.....	.....	.....	.....	.80@ .90
SOUTHERN:						
Albany, Ga.	.70@1.00	.....	.....	.....	.....	.....
Dudley, Ky. (Crushed Sand)	.....	**1.15**	.....	**1.10**	.....	.....
Lindsay, Tex.	1.50	.....	.....	.....	.50	.....
Valde Rouge, La.	.....	.....	.....	.....	.....	.60@ .75
Waco, Texas	.....	.80	.....	1.50	.....	1.30
WESTERN:						
Roseburg, Ore.	1.75	1.50	1.75	1.50	1.50	1.50
Saratoga, San Jose, Calif.	.....	**.60@ .75**	**.60@ .70**	**.60@ .70**	**.60@ .70**	**.60@ .70**
Yorkville, Ore.	.....	.40	.....	.....	.40	.....

* Cubic yard. B Bank L Lake. ‖ Ballast.

Crushed Slag

City or shipping point	Roofing	¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Bethlehem and Emaus, Pa.	2.50	.90	1.50	1.20	1.20	1.20	1.20
Buffalo, N. Y.	2.35	1.30	1.30	1.30	1.30	1.30	1.30
E. Canaan, Conn.	4.00	1.00	2.50	1.35	1.25	1.25	1.25
Eastern Pennsylvania and Northern New Jersey	2.50	.90	1.50	1.10@1.25	1.10@1.25	1.10@1.25	1.10@1.25
Erie, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Emporium, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Hokendaugua and Donaghmore, Pa.	2.50	.90	1.50	1.20	1.20	1.20	1.20
Lebanon, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Sharpsville and Struthers, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania	2.50	1.25	1.25	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.	All sizes, $1.50, F. O. B. Chicago						
Detroit, Mich.	All sizes, 1.65, F. O. B. Detroit						
Ironton, Jackson, O.	2.00	1.35	1.35	1.35	1.35	1.35	1.35
Toledo, O.	2.20	1.70	1.95	1.95	1.95	1.70	1.70
Youngstown, Dover, Hubbard and Leetonia, O.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
SOUTHERN:							
Alabama City, Ala.	2.05	1.00	1.25	1.25	1.25	1.00	.95
Ensley, Ala.	2.05	1.00	1.25	1.25	1.25	1.00	.95
Longdale, Goshen, Glen Wilton and Low Moor, Va.	2.50	1.00		1.25	1.25	1.15	1.05

Agricultural Lime and Hydrate

	—Agricultural Lime— Bulk	Bags	Per Cent CaO	Per Cent MgO	Agricultural Hydrate Bags
EASTERN:					
Adams, Mass.			98	38	8.00
Bellefonte, Pa.	10.50		95.5	.72	11.50
Berkeley, R. I.			50	18	15.00
Branchton, Pa.		5.50			
Cavetown, Md.	8.50				
Cedar Hollow, Devault, Rambo and Swedeland, Pa.	10.50		45.50	30.50	13.00
Chippewa, Pa.	6.50@7.00		78.67	1.33	
Farnams, Mass.	6.50	8.00	60	2	
Frederick, Md.	7.75		88	5 to 8	10.50
Grove, Md.	8.00				10.75
Highgate Springs, Vt.	6.00		85	2	8.00
Hyndman, Pa.	5.00	8.50	80.23	2.87	
Lime Kiln, Md.	9.50	13.50			13.50
Lime Ridge, Pa.	5.25@6.50		80.56-62.56	3.87-1.75	
Mt. Union, Pa.	6.25		93.69		
Newburgh, N. Y.			57	38	8.00
New Castle, Pa.	3.50	4.50	47.6 to 50.4	0.62 to 1.12	
Paxtang and Lemoyne, Pa.	4.00@6.00		60	12	
Rosendale, N. Y.	8.00	9.00	92	5	
Union Bridge, Md.	11.00	5.50	73	1	13.00
Williamsport, Pa.	6.25	12.00	84-87	2-3	12.00
West Rutland, Vt.	5.50	8.00	68	3	
West Stockbridge, Mass.	3.35	5.35			12.00
York, Pa.	10.50		70	3	13.00
CENTRAL:					
Alton and Hannibal, Ill.	11.50		95		
Delaware, O.			50.0	12	13.50
Knowles and Valders, Wis.	4.00	9.00	55	45	13.00
Manistique, Mich.	11.00		95	2	11.00
Marblehead, O.					13.00
Mitchell, Ind.					13.50
Sheboygan, Wis.	5.50	8.50	58	40.5	
Woodville, Ohio	7.00	9.00	48	36	13.00
SOUTHERN:					
Blowers, Fla.	5.50		98.5		
Burns, Tenn.	10.00		96	0.54	14.00
Chippewa, Fla.	5.00		80.0	15.0	
Claremont, Va.	5.00	7.00	85-95	2-5	
Dittlinger, Texas		9.00@11.00	98.62	0.29	12.50@15.00
Erin, Tenn.	11.00		97.82	0.12	
Knoxville, Tenn.	12.00		98.5	.05	15.00
Lushing, Va.	9.00	11.25	60	15	12.75
Maxwell, Va.	6.50		84		6.50
Newala, Ala.	8.10		99.33		
Ocala, Fla.	4.00	6.00 pulv.	98½ (dry basis)		
Staunton, Va.	9.00	11.50	80.00	15.00	
WESTERN:					
Colton, Calif.	15.00		97	2	
Kirtland, N. Mex.	12.00				
San Francisco, Calif.		15.00	97	0.33	15.00
Tehachapi, Cal.	6.00	8.00	96	2	

Miscellaneous Sands

(Continued from preceding page)

Bowmantown, Pa.—Core	1.35@1.50
Molding, coarse	1.70
Bridgeton, N. J.—Core	2.00
Cleveland, O.—Molding coarse	2.00@2.50
Brass molding	2.00@2.50
Molding fine	2.00@2.50
Core	1.25@1.50
Columbus, O.—Core	1.00@3.00
Brass molding	3.50@4.00
Glass sand	3.00
Molding fine and coarse	3.00
Conneaut, O.—Molding fine	2.25@2.50
Molding coarse	2.00@2.25
Delaware, N. J.—Molding fine	2.00
Molding, coarse	1.90
Brass Molding	2.15
Eau Claire, Wis.—Core	.60@ .70
Sand blast, wet	1.75@2.25
Sand blast, dry	3.00@3.50
Traction	.60@ .70
Fleetwood, Pa.—Furnace lining	2.25
Franklin, Pa.—Traction	2.25
Brass molding	2.50
Core	3.00
Molding fine	3.00
Molding coarse	3.00
Sand blast	5.00
Greenville, Ill.—Molding coarse	2.00@2.25
Hancock, Md.—Core and brass mldg.	1.65
Hellam, Pa.—Core	2.00@2.50
Joplin, Mo.—Stone sawing, flint	1.25
Kansas City, Mo.—Missouri River core	.80
Klondike and Gray Summit, Mo.—Molding fine	2.00@3.00
Mapleton, Pa.—Core, furnace lining, molding fine and coarse damp	2.50
Core, furnace lining, moulding, fine and coarse, dry	3.00
Massillon, O.—Molding fine	4.00
Core and molding, coarse	3.50
Glass sand	4.00
Traction	3.50
Furnace lining	4.00
Michigan City, Ind.—Core, bank	.75
Millington, Ill.—Glass and core	2.25
Core sand	2.25
Furnace lining	2.50
Roofing sand	2.25
Stone sawing	2.25
Mineral Ridge, O.—Core, molding, sand blast, roofing, etc., washed, screened (damp)	3.25
Montoursville, Pa.—Core and traction	1.50@2.00
Brass molding	1.75@2.25
Glass sand	2.00@2.75
New Lexington, O.—Molding fine	4.25
Molding coarse	3.75
Oregon, Ill.—Core, furnace lining, molding fine and coarse	2.25@2.75
Sand blast	3.50
Ottawa, Ill.—Crude silica sand	1.50@1.75
Ottawa, Ill.—Core, furnace lining, steel molding	3.00
Sand blast	5.00
Glass sand	2.50@3.00
Roofing sand	2.50@5.00
Ridgeway, Pa.—Glass sand, green	2.25
Glass sand, wash	2.50
Molding, fine and coarse	1.20
St. Peter, Minn.—Glass sand	2.25
Core sand	2.25
Brass molding	2.25
Molding fine	2.25
Rockwood, Mich.—Glass sand, core, roofing, stone sawing	3.50@4.00
Sand blast	3.50@4.00
Thayer, Pa.—Traction	2.25
Furnace lining	1.40
Molding fine and coarse	1.25@1.50
Core, steel	2.50@3.00
Tygarty, Ky.—Core and stone sawing	2.60
Fire-brick sand, washed but not dried	2.15@2.40
Utica, Pa.—Core	3.00
Molding fine	3.00
Molding coarse, traction	3.00
Brass molding	3.00
Warwick, Ohio—Core, furnace lining, molding fine and coarse (dry)	3.00
Same, green	2.50
Wedron, Ill.—Core (crude silica)	1.25
Molding fine	1.50
Furnace lining	1.50
West Albany, N. Y.—Molding fine	2.50
Molding coarse	2.50
Brass molding	2.50
Zanesville, Ohio—Molding fine and brass	2.50@3.00
Molding coarse	2.25@2.50

Crushed Gypsum

Castalia, O.—Crushed, to cement mills	4.50
Ft. Dodge, Ia.—Bulk	4.00
Grand Rapids, Mich.—Crushed gypsum rock	4.00
Gypsumville, Man., Can.—Crushed	3.50
Oakfield, N. Y.	4.00
Gypsum, O., and Akron, N. Y.	4.50@5.50

(Gypsum) Land Plaster

Castalia, O.—Land plaster	6.00
Bags extra—Jute, 3.00; ppr., 1.00.	
Garhutt, N. Y.—Land plaster, bags	8.00
Grand Rapids, Mich.—Ground gypsum rock	5.00
Mound House, Nev.—Ground gypsum rock	7.50@8.00
Sacks, .25 extra	
Oakfield, N. Y.—Ground Gypsum rock	8.00
Plasterco, Tex.	12.00
Sandusky, O.	6.00
Jute, 3.00 extra; ppr., 1.00 extra.	
Los Angeles, Calif.	12.40@14.40

Ground Rock Phosphate

Centerville, Tenn.—B. P. L., 70%; ton, 2000 lbs. (90% thru 100 mesh)	9.00@10.00
Lump rock, 72% to 75%, B. P. L.	6.00@8.50
Centerville, Tenn.—B. P. L., 65%	8.25
B. P. L., 70%	9.00@10.00
Brown rock, 75% and better	12.00
Gordonsburg, Tenn.—2000 lbs. (90% thru 100 mesh)—B. P. L., 60%	6.00
B. P. L., 65%	7.00@9.50
B. P. L., 70%	9.50
B. P. L., 72%	9.50
B. P. L., 75%	12.00
Lump rock, long ton, 70%	9.00
Mt. Pleasant, Tenn.—(B. P. L. 68%)	
13% phosphorus	7.50@9.00
14% phosphorus	8.00
Mt. Pleasant, Tenn.—B. P. L., 70%	10.00
Norwills, Fla.—Fla. Hard Rock (B. P. L., 68%)	10.00
Wales, Tenn.—(B. P. L., 70%)	8.75

Florida Soft Phosphate

Bartow, Fla.—B. P. L., 60%, bulk	10.00
Croon, Fla.—Ground pebble, 30%	16.00
Pulverized soft, 26%	17.50
Jacksonville (Fla.) District	10.00@12.00
(Add 2.50 for sacks)	
Norwills, Fla.—B. P. L., 60%, bulk	10.00
Phoslime, Fla. (in burlap bags)	15.00

Portland Cement

Current warehouse prices, carload lots at principal cities, without bags:

New York (del.)	$4.10
Jersey City (del.)	3.55
Boston	3.32
Chicago	2.35
Pittsburgh	2.42
Cleveland	2.73
Detroit	2.71
Indianapolis	2.61
Toledo	2.71
Milwaukee	2.59
Duluth	2.35
Peoria	2.63
Cedar Rapids	2.71
Davenport	2.76
St. Louis	3.45
San Francisco	3.09
New Orleans	4.60
Minneapolis	3.30
Denver	3.25
Kansas City	2.76
Seattle	3.12
Dallas	3.85
Atlanta	3.75
Cincinnati	2.85
Los Angeles	3.10
Baltimore (del.)	4.59
Montreal (including bags)	3.00
Detroit	3.71

NOTE—Bag charge is generally 25c each.

Natural Cement

Current price for 500 bbl. or over, f.o.b., exclusive of bags:

	Current
Minneapolis (Rosendale)	$3.00
Kansas City (Ft. Scott)	1.60
New Orleans	3.36
Atlanta (Magnolia)	1.90
Cincinnati (Louisville)	2.85
Boston (Rosendale)	2.35

Roofing Slate

The following prices are per square (100 sq. ft.) for slate, f. o. b. cars, quarries, Bangor, Penn.

No. 1 Clear Slate

Sizes	Price
24x14	10.85
24x12	10.85
22x12	11.55
22x11	11.55
20x12	11.55
20x10	12.60
18x12	11.90
18x10	12.60
18x 9	12.60
16x12	11.90
16x10	12.60
16x 9	12.60
16x 8	12.60
14x10	11.90
14x 8	11.90
14x 7	11.20
12x10	11.20
12x 8	11.20
12x 7	11.20
12x 6	11.20
10x 8	9.10
10x 7	9.10
10x 6	9.10

No. 2 Clear

24x12	8.75
22x11	8.75
20x10	9.45
18x10	9.45
18x 9	9.45
16x 8	9.10
14x10	9.10
14x 8	9.10

No. 1 Odd Sizes

18x18	13.30
16x16	13.30
14x14	13.30
12x12	13.30

The following are the prices per square for slate, f.o.b. cars quarries, Granville, N. Y., the prices given in each case being for No. 1 Sea Green Roofing Slate:

22x11, 20x12, 20x11, 20x10, 18x12, 18x10, 18x9, 16x12, 16x10	11.90
16x12, 16x10	11.90
24x12, 22x12, 16x9, 16x8, 14x12, 14x10	11.55
26x14, 24x14, 22x14, 20x14	11.20
14x9, 14x8, 12x10	10.50
14x7, 12x9, 12x8	9.80
12x7, 11x8, 11x7, 10x8	9.10
12x6, 10x7	8.40

Granulated slate per net ton, f. o. b. quarries, Vermont and New York, 7.50@12.00.

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton	
	Finished	Common
New York	$21.00	$20.00
Kansas City	27.20	26.20
Chicago	.....	.....
St. Louis	27.00	21.00
Boston	27.50	25.25
Dallas	.....	25.00
Cincinnati	17.20	16.20
San Francisco	25.40	22.00
Minneapolis	29.50	23.00
Denver	32.00	.....
Detroit	23.00	19.00
Seattle	30.00	.....
Los Angeles	2.75†	2.20†
Baltimore	23.50 (East)	.....
Montreal	25.00	25.00
Atlanta	.....	.....
New Orleans	24.50	24.50

	Lump per 200-lb. Barrel	
	Finished	Common
New York	$ 5.00 at plant	$ 5.50*
Kansas City	2.50	2.40
Chicago	.....	1.90
St. Louis	.....	2.75
Boston	3.70†	3.40†
Dallas	.....	2.50†
Cincinnati	.....	13.20‡
San Francisco	.....	2.25
Minneapolis	2.00	1.85
Denver	1.05 (bu.)	.....
Detroit	2.00†	1.80†
Seattle	2.85†	.....
Los Angeles	2.75†	2.00†
Baltimore	.....	13.00‡
Montreal	15.00‡	15.00‡
Atlanta	3.00†	2.75†
New Orleans	3.00	2.85

*300-lb. barrels. †Per 180-lb. barrel. ‡Per ton.
NOTE—Refund of 10c per barrel with 25c per ton off on hydrated.

Talc

Prices given are per ton f. o. b. (in carload lots only) producing plant, or nearest shipping point.

Baltimore, Md.—Crude talc	4.00
Cubes	60.00
Blanks, per lb.	.08
Henry, Va.—Crude talc (lump mine run), per 2000-lb. ton	3.50
Ground talc (20-50 mesh), bags	8.75
Ground talc (150-200 mesh), bags	13.50
Chester, Vt. — Ground talc (150-200 mesh), bulk, 10.50@12.00; bags	12.00@14.00
Chatsworth, Ga.—Crude talc	8.00
Ground talc (150-200 mesh), bags	14.00
Pencils and steel workers' crayons, per gross	2.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk (Bags extra)	8.50@10.00
Ground talc (150-200 mesh), bulk (Bags extra)	10.00@22.00
Waterbury, Vt.—Ground talc (20-50 mesh), bulk (Bags extra)	8.50@10.00
Ground talc (150-200 mesh), bulk, 10@15.00 and (Bags extra)	10.00@20.00
Biltmore, N. C.—Ground talc (150-200 mesh), 200-lb. bags	15.00@30.00
Pencils and steel workers' crayons, per gross, 1.25@1.45 and	1.55@ 1.60
School crayons, per gross	1.15@ 1.20
Roller mill crayons, per gross	1.75@ 1.90
Keeler, Calif.—Ground talc (150-200 mesh), bags (Bags extra)	18.00@40.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Michigan City, Ind.	14.00@15.00
Milwaukee, Wis. (delivered at job)	18.50
South Dayton, Ohio	16.50
Albany, Ga.	16.00
Brighton, N. Y.	20.50
Buffalo, N. Y.	17.00
Winnipeg, Can. (less $1 trade disc.)	19.00
Boston, Mass.	21.00
Syracuse, N. Y.	24.70
Washington, D. C.	15.50
Portage, Wis.	25.00@30.00
San Antonio, Texas—Common	19.00@22.00
Face	30.00@35.00
Boise, Idaho (in yard)	18.00
El Paso, Texas	16.00

In an early issue ROCK PRODUCTS will begin quoting prices of concrete brick.

Missouri Valley Sand and Gravel Convention at Kansas City

IT HAS BEEN announced that the Missouri Valley Sand and Gravel Association will hold its annual convention in Kansas City, Mo., on Dec. 16 and 17. The first session will start at 10 a. m. at the Muholbach Hotel. Reservations should be made now, for no member of the association can afford to miss these meetings, as many important questions will be discussed.

The association will provide luncheons on the 16th and 17th, a dinner on the night of the 16th, and a theater party that same evening.

It has also been announced that the Iowa Sand and Gravel Producers Association will hold a special meeting at Des Moines, Iowa, Tuesday, Dec. 14, at Hotel Savery, 10 a. m.

Value of Rock Phosphate

NOW THAT THE farmers of the State of New York apparently recognize the value of phosphoric acid as an all-round fertilizer, especially on dairy farms where it can be supplemented with farm manure, the workers in soil fertility at the New York State College of Agriculture say that rock phosphate, which has been a sort of a despised poor relation among the sources of phosphoric acid, is entitled to a word of defense and praise. Most farmers think of acid phosphate as the best and only source.

Rock phosphate, on the other hand, has always cost less a ton than acid phosphate, but its phosphoric acid is not so readily available, and heavier applications must be made for equivalent results. Further, the prejudice against rock phosphate has grown up, perhaps, largely because acid phosphate manufacturers and dealers have taken advantage of every opportunity to condemn the material as practically worthless.

Chicago Cement Co. Reduces Prices

THE MARQUETTE Cement Manufacturing Co., of Chicago, Ill., has just issued the following announcement:

Effective Dec. 3, 1920, Marquette Cement Manufacturing Co. reduces its prices approximately 20 per cent for all public work and home building.

This drastic action is taken for the sole purpose of relieving the present deplorable condition—with the further hope that it will affect and stimulate many other price reductions in building materials, which should substantially improve the supply of homes and public necessities.

General Market News

Material Men to Write New Specification for Indiana Road Work

NEW SPECIFICATIONS are being prepared for road construction work in Marion county, Ind. A committee is at work preparing the specifications to be submitted to the county commissioners. The members of the committee are Thomas W. Kelly, salesman for a Wisconsin granite Co., C. B. Franks, district engineer of the Portland Cement Association, Lawrence Miller, a member of the Miller Sand and Gravel Co., C. C. Mason, a deputy in the commissioners' office, and J. J. Griffith, county surveyor. Mr. Griffith said that the committee would be ready to report shortly, suggesting changes in the road material specifications.

Lewis W. George, county commissioner, said the old specifications provide for the use of gravel with a certain aggregate of fineness that almost eliminates gravel obtained in Marion county as material for the work. When the gravel aggregate specifications are changed, he said, it is necessary for the specifications to be altered as to the quantity of cement and other materials. He said the gravel in Marion county pits is as suitable for the work as any other gravel and for that reason the specifications are to be revamped.

"Seeing Is Believing"—The Way to Sell the Farmers "From Missouri"

JOHN C. REINDELL, of Adair County, Missouri, used two carloads of ground limestone on his farm in 1918. The county agent tested samples of soil and determined that two tons of limestone to the acre would correct the soil acidity. This fall Mr. Reindell is attempting to get for himself and neighbors 300 tons more, but has not yet been successful. When the county agent called on him early in November he found him thrashing clover with a clover buller, the only one in the county. Mr. Reindell said that his wheat, sixty acres of it on limed ground, made 32½ bushels to the acre, and that the stand of clover was perfect. He used 150 pounds of commercial fertilizer to the acre. It is his success with limestone, phosphates, and clover, brought about by adopting methods advocated by the University of Missouri College of Agriculture, which has resulted in his neighbors beginning to use similar methods.—"Farm News Service" of the Missouri Department of Agriculture.

National Association of Sand and Gravel Producers Employs Counsel

FRANCIS B. JAMES, Washington, D. C., a specialist in cases involving interstate commerce, has been employed as legal counsel by the president and directors of the National Association of Sand and Gravel Producers to press the claims of the association's members against the Interstate Commerce Commission for its now notorious orders discriminating against the sand and gravel and other similar industries using open-top cars.

President V. O. Johnston, of the Association, is a lawyer, as are also George V. Miller, Indianapolis, Ind, treasurer, and B. H. Atwood, Chicago, a director. Guy C. Baker, of the Ohio Association, is also a practicing lawyer, so that altogether the sand and gravel industry has plenty of legal talent at its disposal in the preparation and presentation of its case.

Mr. James is one of the attorneys representing the National Paving Brick Manufacturers Association, the American Face Brick Association and the Hollow Building Tile Association in a case now pending before the Interstate Commerce Commission, in which the brick manufacturers are seeking a readjustment of the rates ordered by the commission last summer.

Canada Cement Co. Resumes Full Operation

THE CANADA CEMENT CO. announces that it is now prepared to supply cement for all purposes. For some time production was curtailed on account of coal shortage. Some jobs have been held up because of cement shortage but a letter from the Canada Cement Co. shows that there need be no further hold up in construction work for lack of cement. The letter says:

"Owing to the unfortunate coal shortage during the mid-summer, the production of cement was seriously curtailed, bringing about quite an acute shortage of cement for building construction during the past few months. More recently a shortage of sacks made it necessary for us to ship a large proportion of our orders in bulk.

"We understand that these conditions have been an influential factor in holding up considerable work. However we are now pleased to advise that coal is moving freely, and we are receiving an ample supply at the present time with every prospect of a continuance of this condition.

"We have been able to start up mills which were closed down. The sack situation has also improved materially and we are now in a position to take on business for shipment from the middle of November in unlimited quantities.

"Work pending or held up on account of the difficulty in securing cement may now be proceeded with, with every assurance that all requirements will be taken care of promptly."

Alabama Silica Co. Sold for $42,000

D. L. STULL, of Birmingham, Ala., has acquired the equipment and land holdings of the Alabama Silica Products Co., at Trussville, for a sum reported to be $42,000.

Mr. Stull will begin at once the rehabilitation of the plant and expend a large amount in improvement of its facilities and expects to resume shipments of its products on a large scale. The products of this company consist of a high grade of silica, used by all glass manufacturers, and which is shipped in large quantities to Chattanooga and Tallapoosa and used in the manufacture of glass and high grade enamel ware. Included in the output of this plant is also a high grade of molding sand used exclusively by large pipe plants and foundries in Birmingham.

Georgia Highway Building Proceeding in Earnest

HIGHWAY CONSTRUCTION projects aggregating $1,690,000 have been completed in Georgia within the past twelve months, and projects aggregating $10,500,000 are now in progress, according to an official announcement of the Georgia State Highway Department. Every county seat in Georgia is to be linked together by the construction of a state highway system.

Practically all completed projects were built with a combination of federal, state and county funds, and most of the pending projects are to be similarly financed. The projects now in progress number 122, and about 3,500 men and 1,200 teams are engaged in the work.

U. S. Gypsum Co. Declares New Stock Dividend

THE directors of the United States Gypsum Co. have declared an extra stock dividend of 5 per cent on its common stock, payable on December 31 to stock of record on December 15. The dividend amounts to $195,245 par value and increases the company's outstanding stock to $4,100,145. The regular quarterly dividends of 1 per cent on its common and 1¾ per cent on its preferred were declared, payable on December 30 to stock of record on December 15.

California to Resume Road Construction

THE PEOPLE of the Pacific Coast have shown their desire for road improvements in the recent election. California has voted to increase the interest rate on road bonds, so that they can be disposed of and money secured to complete the extensive road-building program that has been outlined. Prior to the election the uncertainty of future developments resulted in inaction on the part of contractors, highway engineers, road machinery concerns, and material dealers. However, there is now no excuse for inaction and all are looking forward to a re-establishment of active highway construction.

Get the Delegates from Your Local Farm Bureaus to Vote for More Federal-Aid Roads!

THE RELATIONSHIP of good roads to agriculture and the necessity of a constructive road-building program as an adjunct to a national agricultural policy will be among the important topics discussed at the second annual convention of the American Farm Bureau Federation which will be held in Indianapolis December 6, 7 and 8, bringing together one of the greatest gatherings of agriculturalists in the history of the country.

Agricultural leaders and others prominent in the national life of the country will address the convention which will comprise delegates representing the million and more members of the American Farm Bureau Federation in the 33 states over which its organization extends. They include W. P. G. Harding, Governor of the Federal Reserve Board; Governor W. L. Harding of Iowa, Governor Goodrich of Indiana; Henry Wallace, editor of a national farm magazine; T. H. McDonald, chief of the U. S. Bureau of Public Roads; Clifford Thorne of Chicago, transportation expert; J. R. Howard, President of the American Farm Bureau Federation; Gray Silver, legislative representative of the Federation, and Sir Aukland Geddes, the British Ambassador to the United States.

Others who are expected to speak are E. T. Meredith, Secretary of Agriculture, Herbert Hoover, and William Redfield, former Secretary of Commerce.

The importance of adequate means of transportation for marketing farm products and for bringing about closer communication between the producer and the consumer which will be of mutual benefit, will be taken up on the opening day of the convention, and the entire afternoon session will be devoted to this discussion. T. H. McDonald, chief of the U. S. Bureau of Public Roads, will tell of the need of more and better highways and the necessity of making provision for them in a national agricultural program. He will also dwell on the advantages to the farmer offered by the motor truck for marketing products over short distances. H. G. Shirley, Secretary-treasurer of the Federal Highway Council, will present a national highway policy covering both construction and maintenance of highways.

Lime and Fire Protection

A REPORT by the National Board of Fire Underwriters on the recent fire in the brick and reinforced-concrete warehouse of the Imperial Tobacco Co., of Norfolk, Va., which resulted in a total loss, has a very direct bearing on the use of lime in concrete. Among other faults the quality of the concrete was poor, the mixing was carelessly done, the placing of reinforcement was faulty, and its protection was inefficient.

Any one who has seen the complicated mats of steel bars which are laid in the bottom of concrete beams will appreciate how difficult it is to insure that the concrete will perfectly surround and enclose each bar, but that it should, is vitally necessary in order that the intense heat of a fire may be kept as long as possible away from the steel which, by its quick and extreme expansion, would burst the concrete and destroy the building. Ordinarily large amounts of water are added to concrete to increase its flowability and aid in complete filling of the forms, but this water easily separates from the rest of the batch forming pools at the most unexpected points in place of the concrete which should occupy the space. Recent inspection of a new concrete building revealed that in one-third of the beams the steel rods were visible after the forms were removed. It is impossible to repair such a condition, and the building is permanently rendered less safe.

Hydrated lime added in the recommended proportions, however, gives the necessary plasticity and ease of flow through chutes, around steel reinforcement, in complication forms with an actual reduction in the tendency to segregation, smoother surfaces, lighter color and no measurable decrease in strength either in compression or in bending, while its alkalinity inhibits rusting of the steel.—Bulletin of the National Lime Association.

High Calcium Lime for Refractory Brick

SILICA BRICK for refractory purposes are made from quartzite crushed to pass through a 2-in. ring. Washing of the rock to remove foreign or earthy matter may be resorted to at certain places. The material is then taken in a car to the wet pan and there dumped. Each charge for a pan weighs about 1,250 pounds. A little water is added and the material is ground for 15 minutes. After 10 minutes of this grinding, 2 per cent of lime by weight is added as slaked high-calcium lime, in the form of a thin slip. It is run through a spout to the middle of the crushing surface of the pan, while the pan is in motion. * * * In this way the lime is thoroughly mixed with the quartzite. When the grinding has continued for the full 15 minutes the mix is ready for molding and is removed from the pan to a tramcar by means of a mechanical scraper.

The lime is prepared by weighing out enough quicklime to furnish exactly 2 per cent of CaO to the weight of quartzite. The weighing out is done on the basis of an analysis. Thus, if the lime contains only 90 per cent CaO, proportionately more is added. This lime is then placed in a small mixer or blunger, is slaked and stirred up to the proper consistency; and then run through a screen of approximately 10 meshes per linear inch on its way to the wet pan. Hydrated lime is sometimes weighed into the mixer instead of quicklime and appears to give exactly the same results.

Silica refractories are particularly useful in industrial work. This is due to their rigidity at temperatures above the range of usefulness of ordinary fire-clay brick and to the fact that they expand slightly when heated instead of shrinking as clay brick do.—U. S. Geological Survey.

Lehigh Combination Concrete and Lumber Computing Scale

THE LEHIGH PORTLAND CEMENT CO., Allentown, Penn., has just issued a new advertising feature to the many already out. This is a combination concrete and lumber computing scale, on the same principle as its well-known concrete computing scale, but having on the reverse side the scales showing the feet, board measure, in various lengths of lumber of standard size. In addition to the lumber computing scale this side of the device also carries conversion tables for dry measure, square measure, length measure and liquid measure.

Buyers for Various Rock Products

R. JOHANNESSEN, Kristiania, Norway, is in the market for Florida hard rock phosphate in cargoes of about 5000 tons.

W. H. Fisher, Archbold, Ohio, wants to buy crushed granite and rock chips of various colors for use in surfacing stucco. The colors wanted are pure white, green, red, tan, etc. Quote prices in single carload lots.

News of the Industry

Incorporations

Maryland Flint & Feldspar Co., Inc., Bel Air, Md., has been incorporated for $500,000.

Ranger Quarry Co., Ranger, Tex., has been incorporated for $100,000 by J. H. Canfield, C. L. Twigg, Jr., and E. H. Canfield.

Allen Gravel Co., New York, N. Y., has been incorporated for $150,000 by A. J. Kingsbury, D. D. Wharton and L. D. Phillips.

The Pennsylvania Sand Blast Co., 506 Market St., Camden, N. J., has been incorporated for $300,000 to deal in sand, gravel, etc.

Ruby Mining and Milling Co., Portland, Me., has been incorporated for $100,000 by Wm. H. Wetsell, G. E. Urquhart and C. B. Skillin.

The Lyth Tile Corp., Buffalo, N. Y., has been incorporated for $200,000 by H. Wittman of Buffalo, to manufacture tile and fireproofing materials.

Wysaugil Granite Co., Thomaston, Me., has been incorporated for $10,000, by A. E. Saylor, president and treasurer, W. K. Saylor and H. H. Gilchrist.

The Nelson-Grindt Concrete Co. has been incorporated in Racine, Wis., with a capital stock of $50,000, by Earl C. Nelson, Leslie D. Nelson and others.

Beverly Stone & Sand Co., of Knox county, Tennessee, has been incorporated for $25,000 by Charles M. Seymour, T. G. McConnel, A. L. Mason, B. H. Testerman and E. M. Richards.

Sugar Loaf Sand and Gravel Co., San Diego, Calif., has been incorporated for $25,000 by E. A. Kavanaugh, H. B. Coffield, S. W. Wilson, J. H. Peak and D. E. Hayworth, all of San Diego.

Consolidated Construction, Power & Minerals Co., Kittery, Me., has been incorporated for $1,000,000 to engage in mining and quarrying by John O'Donnell, president; O. H. Nelson, secretary, and A. B. Cole.

Regal Blue Marble Co., Regal, N. C., has been incorporated with a capital of $300,000. It is planning for extensive production operations in that section. The president of the organization is R. L. Harris, Murphy, N. C.

The Commonwealth Brick Co., Worcester, Mass., has been incorporated for $50,000 by W. M. Johnson of Worcester, I. E. Bigelow of Shrewsbury and G. L. Baldwin of Charlton to manufacture concrete products.

The Silica Products Co., Portland, Ore., has been incorporated for $100,000 to mine, manufacture and sell silica, sands and other silica products. The incorporator is Arthur Languth, 604 Northwestern Bank Bldg., Portland.

Farmers Building & Supply Co., Rockwell City, Ia., has been incorporated for $15,000 to handle brick, tile and building materials, by M. C. Ferring, president; A. L. Schmidt, vice-president, and C. J. Pilmier, secretary-treasurer, all of Dubuque, Ia.

The Pennsylvania Deconstructed Stone Co., Williamsport, Pa., has been incorporated for $15,000 by J. M. Walsh, K. A. Walsh, and W. B. Carn. The purpose of the company is to manufacture, buy and sell building supplies and equipment and the carrying on of a general contracting business.

Inter-State Portland Cement Co., Des Moines, Ia., has been incorporated with a capital of $3,100,000. The officers are: President, Parley Sheldon, Ames, Ia.; vice-presidents, L. K. Nickols and W. B. Barney; secretary-treasurer, Paul W. Carroll; general counsel, George Cosson; chairman of the board, B. F. Carroll.

Swan Lake Brick Co., Pengilly, Pa., has been incorporated for $50,000 to manufacture sand-lime brick, building blocks and other articles manufactured from sand, lime, and cement by C. Latvala, Nashwauk, Minn., president; R. L. Hall, Pengilly, Minn., vice-president, and R. H. Johnson, Hibbing, Minn., secretary-treasurer.

Constant Sand & Gravel Co., Denham Springs, La., has been incorporated with a capital of $125,000 for the purpose of developing the Amite river gravel deposits. New equipment is being installed and a spur track from Baton Rouge to the gravel pit will be put in. It is planned later to erect a glass plant. The officers of the company are: President, F. T. Constant; treasurer, George Bailey, and general manager, T. T. Harrison.

Douglas Phosphate Co., Seattle, Wash., has been incorporated for $100,000.

The American Talc Mining Corp., Kinney Bldg., Newark, N. J., has been incorporated for $600,000.

The Producers Sand & Gravel Co., Houston, Tex., has been incorporated for $100,000 by Ray McDonald, O. K. Willborg and Joe Cathriner.

British Talc & Mineral, Ltd., has been incorporated with a capital of $200,000 by G. W. De C. O'Grady and others. The head office is at Toronto.

Bitnell & Co., Ltd., has taken out a permit for a $3,000 crushed stone handling plant at the west end of Pricefield Road near Rowanwood Ave., Toronto.

Hanks-Maxwell Rock Products Co., Kansas City, Mo., has been chartered with a capital of $600,000. Waltner & Waltner, 504-6 Ridge Arcade, Kansas City, Mo., are the attorneys.

The Sarnia Cement Products Co., Ltd., has been incorporated with a capital of $100,000 to manufacture and deal in cement, lime, etc. Incorporators are W. D. Reid and G. R. McGee of Point Edward and W. J. Barber and F. R. Reeves of Sarnia. The head office is at Point Edward, Ont.

Rockville Granite Co., Cold Spring, Vt., has been incorporated for $200,000 to engage in quarrying granite, marble, rock, etc., and to manufacture same for monumental purposes. The officers are as follows: F. C. Peters, president; N. C. Wenner, vice-president; F. V. Stein, treasurer, all of Cold Springs, and P. H. Alexander, secretary, of Rockville.

Lime

The Nast Bros. Lime & Stone Co., Marblehead, Wis., are reported to make extensive improvements to their kilns near Kewanee, Wis.

The Farmers' Ground Limestone Co., New Paris, Ohio, has been chartered with a capital of $50,000 to pulverize limestone for fertilizer purposes. The incorporators are: A. W. Green, W. L. Hahn, H. M. Miller, S. C. Richie and S. S. Kilbourn.

The Bone Dry Lime Co., near Cassadaga, N. Y., whose $100,000 plant was recently destroyed by fire, announces that it will rebuild at once with steel and concrete construction. The new plant will have added improvements. Charles E. Smith, of Fredonia, is president of the company, and Harry Vickery, superintendent.

The Antrim Lime Co., Petoskey, Mich., whose plant is located in the western section of Petoskey, suffered a $3,000 fire loss. It is thought the blaze originated in a spark from the kiln, causing the destruction of the crusher building, kiln sheds and valuable timbers embracing the two kiln ovens, as well as two high-powered motors.

The Security Cement and Lime Co., Hagerstown, Md., has just completed and put into operation a new quarry crushing plant. This plant consists of a 48x60 Allis-Chalmers jaw crusher, with its necessary equipment. Since completing this installation the company has entirely done away with hand loaders and is operating the quarry with two steam shovels—a large Marion with 3-yd. dipper and a small Thew with ¾-yd. dipper. Side dump cars of 10-ton capacity are being used, built according to the company's own plans by the Wm. J. Oliver Mfg. Co., Knoxville, Tenn. These cars are especially interesting and satisfactory, as they are free from several of the objectionable features of the ordinary side dump contractors' cars. The handling of these cars is done by means of a small Vulcan locomotive. One of the interesting features of the installation is the substantial character of the building which houses the crusher and belt conveyor. This structure is entirely of concrete, the greater part of it monolithic concrete poured in sectional metal forms.

Sand and Gravel

Indianapolis, Ind.—The Board of Works of Indianapolis has ordered the Capital City Gravel Co. to stop removing sand and gravel from White River within 10 days. The board stated that the removal of sand and gravel at this point is endangering the abutments of the Oliver Avenue bridge.

The Standard Sand Co., Cleveland, Ohio, has been incorporated for $50,000 by J. A. Boughton, Chas. A. Patterson, G. H. Billman, A. Ackerman and Wm. Davis.

The Henderson Sand & Gravel Co. has been incorporated in Henderson, Ky., with a capital stock of $25,000 by L. A. Cuttinham, W. C. Cooper and G. Givens.

Mt. Vernon, Ind.—A gravel digger belonging to the Flesher towboat and barge line of Mt. Vernon, Ind., was burned to the water's edge recently while tied to the bank of the Ohio River above the city wharf. The boat was 100 ft. long and 26 ft. wide, and was equipped with a double, belt-driven, eight-inch, centrifugal pump, operated by a 50-horsepower steam engine. It was valued at $16,000 and insured for $9,000. The boat sank in 8 ft. of water. The remainder of the Flesher fleet, consisting of the steamer Monitor, a dry-dock boat, and three barges, was saved. The fire is believed to have started from the kitchen range on the gravel digger.

Quarries

The Smallwood-Low Stone Co., Steubenville, Ohio, announces that on and after Nov. 15, 1920, the offices of the company will be located at Lisbon, Ohio, where all communications should be addressed.

The Griggsville-Perry Co-operative Limestone Association, Griggsville, Ill., has been granted a charter by secretary of state of Illinois. The company has a capital stock of $7,000 and will manufacture and deal in agricultural limestone. The incorporators are Cyrus D. Rush, D. S. Kennedy, Eugene Dorsey, F. H. Farrand and E. J. Liehr.

Chester, Ill.—With the completion of the rock-crushing plant at the Southern Illinois penitentiary here, fertilizing farms in this region with limestone will be done at cost. The land hereabouts contains so much acid that clover cannot be grown, and heretofore manufacturing of limestone has been done privately and at a profit. The limestone from the new rock crusher will be sold at cost, it is announced by state officials in charge.

Rome, Ill.—Big stone quarries will be opened up at Rome soon by the Burlington R. R. The company has bought a 20-acre tract here for $750 per acre. This has a fine deposit of limestone rock, a 90-foot formation. A number of railroad officials have been here recently and it looks now like there will be a great amount of work done here soon. This land is on the river near the Weimer bridge and is about a quarter of a mile from Rome.

Tulsa, Okla.—An immense ledge of limestone rock, 48 ft. thick and containing more than 1,000,000 cubic yards of high quality limestone rock has been found along the Arksansas river, near here, by C. O. Frye, the highway constructor, who is constructing the Sand Springs-Keystone highway. The rock is near the A. V. & W. line of the Frisco, and Mr. Frye is figuring on the cost of a plant to manufacture the rock into cement. Preliminary estimates are that it can be made for $1 a barrel.

The Juniata Limestone Co., Carlim, Pa., has ceased operations, and dismantled and housed all of their machinery. As a result of this 150 men employed about the quarries will now face the necessity of hunting other employment. The company quarries and ships limestone to the steel works and the depression in the steel industry which has lessened the demand for rock was the cause of the suspension. This is the first noticeable depression in the Williamsburg, Pa., district where a number of large quarries are in operation.

The Rock Products Co. has just been incorporated under the laws of Louisiana, with a capital stock of $100,000, for the purpose of operating a large quarry of sandstone at Rock Junction, La. L. S. Bourne and R. P. Eldridge, president and secretary, respectively, of the company are well known business men of Sugar Land, Tex. It is stated that the quarry will be equipped with steam drills, a tractor for stripping the overhead soil, a steam shovel, a rock crusher with a capacity of 1000 tons per day, 10 all-steel dump cars and one-half mile of narrow gauge railroad. The company's holdings embrace 16,000 acres of land, all of which is said to be underlaid with rock of excellent quality. The quarry camp was established at Rock Junction some time ago, and it was from this quarry that the rock for the rip-

rap" of the jetties at Port Arthur, Texas, was obtained. Houses for workmen and other necessary lay-outs are already available, at the camp.

Cement

The Canada Cement Co., Point Ann, near Belleville, Ont., has reopened its No. 4 plant.

Porter & Boyd, a contracting firm of Charlotte, N. C., is in the market for 3,000 barrels of cement and 2,000 yards of gravel.

The Peerless Portland Cement Co., Union City, Mich., has filed mortgage for $200,000 in favor of the Detroit Trust Co., Detroit, Mich. It is given to cover bonds issued in sum of $200 each, 50 of which will be redeemable annually.

The Allentown Portland Cement Co., Evapsville, Pa., is shipping cement by railroad, and a large amount is taken away by trucks. The company is short in laborers which causes great difficulty in the running of the plant.

The Magnolia Development Co. has been organized in Cochran, Ga., by J. J. Bennett, president and treasurer; Fred N. Merry, vice-president and general manager, both of 332 Healey Building, Atlanta, Ga., to develop a 300-acre cement tract there.

Ogden Portland Cement Co., Brigham City, Utah, is reported to be erecting a new cement plant near Pocatello, Idaho, which is expected to be in operation early next spring. The main office of the company is located at 521 Eccles Bldg., Ogden, Utah.

Allentown, Pa.—The advent of cold weather finds the cement mills of the Lehigh district working at top speed with empty storehouses. Should the cold weather cause a reduction in the demand for cement the mills will undoubtedly continue operation and store their products.

The Alpha Portland Cement Co., Easton, Pa., is completing negotiations for the purchase of a cement plant in Illinois and Ohio. Recently it took over a third cement plant in Michigan. The operation of these three plants will increase the output of the Alpha company 50 per cent.

Allentown, Pa.—A special meeting of the Atlas Cement Co., a Pennsylvania corporation, will be held in Northampton, Pa., on Dec. 15, at noon, to take action on an increase in the capital stock from $14,000,000 to $23,000,000. No statement has been made and will not be made as to the reasons for the increase until the day of the meeting.

The Giant Portland Cement Co., Egypt, Pa., is installing a new crushing plant and coal storage bins. A new 48-in. by 60-in. Traylor jaw crusher having a capacity of 300 tons per hour is being installed. The storage tanks for stone will be composed of silo tanks, and will have a capacity of 1000 tons. The plant has sufficient capacity to supply both of the company's mills.

The Texas Portland Cement Co., Dallas, Texas, in line with the policy to keep their mills thoroughly modernized and to adequately provide cement for their trade, announce that plans are prepared and work has actually started on the installation at its Dallas mill of one new 8x9x220 ft. kiln, together with the additional raw mill machinery and other construction necessary for the increased output.

The Hanover Portland Cement Co., Hanover, Ont., is rushing the work on the changes necessary to convert from marl to rock wet process. All retaining walls, tunnels, piers for new machinery, etc., will be completed about November 1, and it is expected to have all the machinery in place and ready to operate by January 1, 1921. Stone is being obtained from a quarry four miles west of Walkerton, Ont., via Grand Trunk R. R. The capacity of the plant will be practically doubled. This work is under the supervision of Guy Bowser, chemical engineer.

Minneapolis, Minn.—About 40,000 barrels of cement will be needed for the 1921 program of street paving, according to an estimate prepared by E. R. Dutton, paving engineer, for the purchasing department. The paving program ordered by the city council will cost about $1,500,000. A total of 332,000 sq. yds. are to be paved. About half of this yardage is to be paved with asphaltic concrete, about 90,000 with creosote blocks and about 50,000 with brick. K. E. Alexander, city purchasing agent, expects to advertise today for bids on cement, yellow pine blocks, brick, pitch, tar and asphalt for the paving program. Bids are to be received Dec. 13 and considered by the council committee on paving Dec. 15.

Gypsum Products

The Canada Asbestos & Chrome Co., Ltd., are erecting an asbestos reducing mill at Coleraine, Que., and will require jaw and gyratory crushers, screens, etc.

American Cement Plaster Co. has commenced work on its cement mill, located two miles west of Dilworth, Okla., on the edge of a 50-acre gypsum deposit. A large frame and corrugated iron building is being erected to house the mill machinery, which is soon to be installed.

Quanah, Tex. — An expansion that will require the employment of 100 additional men and the erection of a number of new residences at its plant is being planned by the American Cement Plaster Mill, at Agatite, about six miles from Quanah, according to a recent announcement. The enlargement of the plant, it is said, will include the addition of a white plaster mill and a board mill.

Silica Sand

The Silica Granite Products Co., Ltd., has been incorporated with head office at Hamilton, Ont. The president is A. R. C. Smith and the secretary-treasurer is A. Caddie. The company's property is in New Ontario in the township of Henwood and consists of 160 acres on which are mounds of granite rock. The rock, when quarried and crushed to various sizes, is used as a basis of cleaners of various kinds, such as dry and wet hand cleaners, household cleaners, etc. The ground rock is found to be good for foundry use for sand blasting. Machinery has been installed and the company expects to start shipment in December.

Retail Dealers

South Barre Granite Co., South Barre, Vt., has increased their capitalization from $5,000 to $25,000.

The Creston Fuel & Building Material Co., of Grand Rapids, Mich., has decreased its capital stock from $15,000 to $8,000.

The Council Lumber Co., Irvington-on-Hudson, N. Y., has been organized with a capital of $300,000 to deal in building supplies.

M. J. Elenbaas & Sons have incorporated their building material business in Grand Rapids, Mich., under the same name, with a capital of $25,000.

The Citizens Builders Supply Co., Columbus, Ohio, has been incorporated with a capital of $15,000 by P. A. McGaughey, H. T. Browne and Mrs. R. Houser.

Montgomery Supply Co., Montgomery, Pa., has been formed with a capital of $50,000 to deal in mason materials and other building supplies. J. S. Callaghan.

The Midwest Construction Co. has been incorporated in Minneapolis, Minn., with a capital stock of $50,000 and will operate quarries, cement and plaster mills.

Southern Hardwood Sales Co., Indianapolis, Ind., has been incorporated for $8,000 to deal in all sorts of building supplies by J. B. Robinson, F. H. Stanford and F. L. Adams.

The Paveglic Granite & Marble Co. has been incorporated in Marquette, Mich., with a capital of $80,000, and succeeds to the already well established business of Paveglic Bros.

Rusk Co-operative Mercantile Co., Rusk, Wis., has been incorporated for $60,000 by Thos. Wittig, Ed Hein and Ed Rosseter to deal in general merchandise and all building materials.

O'Connor & Shields, Baltimore, Md., has been incorporated with a capital of $50,000 to deal in building supplies. The incorporators are Vincent L. O'Connor, Howard S. Shields and Harry A. Valentine.

The Lamolite Granite Co., Hardwick, Vt., has been incorporated to do a general granite quarrying and manufacturing business by T. N. Crowley, M. H. Ambrosini and L. S. Robie, all of Hardwick.

Construction Material Co., Wallington, N. J., has been formed by local interests to deal in building materials of various kinds. The company is headed by Walter L. Fisher, Alfred O. Schleif and George Emerson.

J. N. Cowin & Co., Medford, Mass., has been incorporated with a capital of $100,000 to deal in cement, lumber and other building materials. Frederick B. and Henry M. Walker, and Wm. G. Cummings, Brookline, Mass., head the company.

The Rothe Building Supply Co., Sheboygan, Wis., has taken over the retail building material business of the Sheboygan Lime Works. After Nov. 1, 1920, both companies will be located at 823-825 S. Water St., P. O. Box 378, Sheboygan, Wis.

The Fulton Lumber & Terminal Co., Jersey City, N. J., has been formed with a capital of $1,000,000 to deal in lumber and other building products. The incorporators of the new company are A. Roy Myers, Robert K. Thistle and Raymond J. Gorman.

Westline Rock Co., of Wilmington, Del., has been chartered in Kansas City, Mo., with a capital of $150,000 to be employed in Missouri. The Missouri agent is Jacob Weisser, 3041 East 31st Street, Kansas City, Mo., and Watson, Gage & Ess are the attorneys, Grand Avenue Temple, Kansas City, Mo.

Personals

Elton F. Hascall has been appointed secretary of the Builders' and Traders' Exchange of Detroit, Mich., and has assumed the duties of that office.

Dr. G. Herlitschilsa, formerly chemist for the National Portland Cement Co., Ltd., with works at Durham, Ont., is now connected with the Durham Chemical Company, Ltd.

Henry F. Pratt has been appointed mid-western sales manager of the Taylor-Wharton Iron & Steel Co. and its subsidiaries, with office located at 502 Denham Bldg., Denver, Colo.

E. J. Steckle, formerly assistant superintendent of the Dixon, Ill., plant of the Sandusky Cement Co., has been appointed superintendent of the Syracuse plant of the same company.

John H. Curtis, formerly general foreman of the Oklahoma Portland Cement Co., has assumed the position of mill superintendent for the Indiana Portland Cement Co. Mr. Curtis took up his position October first.

H. L. Shock, formerly with the Canada Cement Co., Belleville, Ont., and the National Portland Cement Co., Durham, Ont., has accepted a position as works manager with the Hanover Portland Cement Co., Hanover, Ont.

Richard K. Meade, chemical and industrial engineer, Baltimore, Md., delivered a lecture before the New Jersey Chemical Society, at Newark, on the evening of Nov. 8, on the "Manufacture of Lime and Hydrated Lime." The lecture was illustrated with lantern slides.

L. T. Heerman, formerly superintendent of the Syracuse, Indiana, plant of the Sandusky Portland Cement Company, has accepted the position of superintendent of construction for the Indiana Portland Cement Co. Mr. Heerman will devote his time to construction matters.

A. W. Tucker, mining engineer, who for many years has specialized in the development of mineral resources of the Southern Appalachians, has resumed private work with office at Salisbury, N. C., after 16 months' field work with the Bureau of Mines in connection with War Minerals Relief claims.

W. S. Morrison, at one time traffic manager for the Oklahoma Portland Cement Co., and later traffic manager for the associated plants of the Cement Securities Co. of Denver, Colo., is now serving as traffic manager for the Indiana Portland Cement Co., in charge of all matters pertaining to traffic and shipments.

H. D. Clouse of Barry, Ill., has recently taken charge of plant operations of the Lincoln Sand & Gravel Co., Lincoln, Ill. Mr. Clouse, for the past two years, has been operating the Barry plant belonging to the Lincoln company. S. R. MacNeal, former superintendent of the gravel pits, has not as yet decided upon a new location.

L. C. Wilson, for the past two years general sales manager of the Chain Belt Co., Milwaukee, Wis., has been elected secretary of the Federal Malleable Co., West Allis, Wis., manufacturers of malleable castings, malleable chain and the Rapid Molding Machine. He assumed his new duties on Nov. 15 and will be succeeded as sales manager at the Chain Belt Co. by Clifford F. Messinger.

E. L. Davis has resigned as superintendent of the Crescent Portland Cement Co., of Wampum, Pa., where he has been for the last six years. Mr. Davis has taken up new duties as superintendent of the United States Potash Co., manufacturers of portland cement and potash. This company's plant is located at Monolith, Cal., Kern County, and was previously operated by the City of Los Angeles.

E. S. Morgan, formerly traffic manager of the Texas Portland Cement Co., of Dallas, Tex., will sail from New York for South America, where he will take the position as vice-president and general manager of the Uruguay Portland Cement Co. He will have charge of the cement mill at Montevideo. Mr. Morgan has been a resident of Dallas for many years and was connected with the Texas Portland Cement Co. until December of last year, when he went to College Point, N. Y., as vice-president and general manager of the Empire Tube and Steel Co.

OBITUARY

Robert Wilson, engineer of Britnall's quarry, Burnt River, near Lindsay, Ont., was killed in an explosion recently. It is stated that the cause was an explosion of dynamite being warmed preparatory to blasting operations.

Ernest Valade, guarryman, in the Laurin & Leach quarry at St. Vincent de Paul, Quebec, was electrocuted on October 4. He was handling some stone drills and in moving one of the drills touched an electric wire, the covering of which was worn away.

Manufacturers

Victor R. Browning, Cleveland, O., has just issued a bulletin pertaining to electric overhead cranes and hoists. The bulletin is very well illustrated and contains much useful data on specifications of cranes.

The Manierre Engineering & Machinery Co., Manufacturers of the Manierre box-car loader, have just issued their 1920 catalogue. The book is very well illustrated, giving general descriptions of the various types of loaders, and illustrations of typical installations.

The Austin Machinery Corp., Chicago, Ill., reports the establishment of 10 primary district offices and warehouses and upwards of 50 subsidiary offices and agencies throughout the United States. This expansion will materially help operators. The cities at which the district offices and warehouses are located were selected with a view of affording the most strategic positions from point of trunk-line shipment. Each warehouse carries a full stock of machines and parts. Their large manufacturing plants are in full production. The needs of foreign countries, as well as all domestic requirements, are provided for. The organization plan by which this was accomplished is so comprehensive and so thoroughly worked out that all types of Austin machines soon will be available, on short notice, anywhere in the United States and in a large section of Canada.

The Worthington Pump and Machinery Corp., New York City, has issued a new catalogue illustrating and describing Worthington marine pumps and auxiliaries (catalogue No. BK-3000). The catalogue consists of 125 pages of descriptive matter and illustrations, and generally it will be found a comprehensive and useful publication.

The Blaw-Knox Co., Pittsburgh, Pa., announce the opening of a new sales office at Birmingham, Ala. It is located in the American Trust Building, and will handle business in the Southern States. Prescott V. Kelly, lately connected with the sales department at Pittsburgh, is in charge of the new office. The company manufactures a large line of fabricated steel products, of which the best known are their clamshell buckets and their sectional steel buildings. The Blaw-Knox offices are now found in every part of the country.

The Locomotive Crane Co. of America, Champaign, Ill., manufacturers of the Little Giant Road Crane, is one of the first concerns in the mechanical line to make use of the aeroplane in rendering to their customers the ultimate in service. Recently the Ferguson Coal Co., of Chicago, operating a Little Giant road crane, was forced to shut down, due to accidental breaking of one of the smaller parts. Realizing the necessity of getting their crane working again at the earliest possible moment, they telephoned the Locomotive Crane Co., at 3:30 in the afternoon. Champaign is some 135 miles from Chicago, but at their request the crane company volunteered to get the parts there that day and did so. They telephoned to Rantoul, which is not far from Champaign, and secured the use of two aeroplanes. These were loaded with the necessary parts and arrived some two hours later at Checkerboard Field, where a truck from the coal company awaited them. This is one of the first instances of the use of the aeroplane for the transportation of mechanical parts in order to save the loss of valuable time occasioned by a shut-down.

The new 1921 edition of Hendrichs' Commercial Register has just been published. The publishers have maintained a high standard in this book, and have retained all of the good features of former editions beside adding new ones. One of the striking features of the book is its simple method of arrangement and complete index, making it the most easily used book of the kind we have seen, a feature which should appeal at once to the busy man. This ease of use is further increased by the exterior index a feature added last year and continued in the new edition. The publishers have added a page of directions entitled "How to Find Information," which gives in concise form detailed instructions as to the best way to find desired information. From this the book is divided into five sections, the "Index to Trades," "Classified Trades," "Trade Names," "Alphabetical," and "Advertisers Index." The purpose and use of each is fully explained.

USED EQUIPMENT

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

EQUIPMENT

Steam Shovels

2—⅝-yd. Thew "O" Traction, Mass. boiler.
1—No. 3 Thew 1-yd. dipper, R. R. type.

Locomotives

1—3-ton Std. gauge Plymouth Gasoline.
4—14-ton 36-in. gauge Vulcan saddle tanks.
2—14-ton 36-in. gauge Porter saddle tanks.
2—18-ton 36-in. gauge Davenport saddle tanks.
1—21-ton 36-in. gauge American saddle tank.

Dump Cars

9—24-in. gauge 1½-yd. Western, 2-way.
35—24-in. gauge 1-yd. Koppel, 1-way.
8—30-in. gauge 1½-yd. all steel quarry end dump.
2—36-in. gauge Koppel 3-yd. V-shape, 2-way.
15—36-in. gauge 4-yd. Western, 2-way.
5—3-yd. 36in. gauge Lakewood V-shape 2-way dump.

ZELNICKER IN ST. LOUIS

Get our new big bulletin 285 for unusual bargains in Railway, Power Plant and Contractors' Equipment, Dump Cars, Track Accessories, Tanks, Pipe, etc.

Idle Machinery Absorbs Profits

This department is the medium for the men who keep the wheels going. Sell your idle machinery to the man who'll keep it going.

FOR SALE

Brand New Corrugated Manganese Steel Mantle for No. 8 "K" Type Allis Chalmers Crusher

This mantle sells at $997—
Our price $550

This mantle is of the "gunlock" type, standard size, corrugated, and was purchased for a crusher that was later wrecked. The mantle has never been used. Write

WEST SIOUX FALLS STONE CO.
Sioux Falls, S. D.

IMMEDIATE DELIVERY

9 K CRUSHER, REG. DRIVE.
2—150 hp. 125 lbs. HRT. Boilers, Butt strap.
4—No. 6 Gates (Man. Fit.) nickel steel shafts.
1—No. 7½ and 1 No. 8 Gates, Reg. drive.
No. 4 Telsmith plant, AC. motor drive.
Air Compressors (Steam, Belt), 50 to 4000 ft.
40 Boilers, 60-150 hp. 100-130 lbs.
100 HP. LOCO. BOILER 125 LB.
4—NEW No. 4 Gates, Mang. Fit. $2000 each.
35 and 112 hp. Elec. Hoists AC. New.
1½ yd. Nagley Slack lined bucket equip.
12—Steel Cars 42 in. Ga. 7 yd. End Dump.
Type "O" ⅜-yd. Thew steam shovel.
50—25-20-15 and 125 kw. eng. and turbo sets.
1—42 in. x 16 in. TRAYLOR ROLL CRUSHER.
2—156 Kva. 240 v. 60 cy. 3 ph. eng. sets.
Send us your inquiries. Pumps, steam and elec. equip, etc. Crushing and power equip.

ROSS POWER EQUIP. CO.
Indianapolis, Ind.

New—RAILS—Relaying

All sections on hand for quick shipment Reasonable prices quoted. Our stock is very complete.

M. K. FRANK
Frick Building Pittsburgh, Pa.

FOR SALE

2—No. 18 Gates K Gyratory Crushers with elevators and screen; complete; first class; immediate delivery. Also twenty other sizes.

J. F. DONAHOO CO.
Birmingham, Ala.

FUEL OIL ENGINES

2—MEITZ AND WEISS INTERNAL COMBUSTION Engines, one 80-H.P., one 100-H.P. Complete. First class condition.

ROCK CRUSHERS

1—No. 2½ Climax.
1—24x15 FARRELL Type "B." Used three months, with Elevator, Screens, Bins, Engine, etc.

A. J. O'NEILL CO.
1524 Chestnut Street Philadelphia, Pa.

60-Ft. Rotary Screen For Sale

5 foot diameter Roller Bearing Revolving Screen, separates 6 sizes of stone or coal. Complete.

Batchelder Bros. Coal Co., Boston, Mass.

CLASSIFIED ADVERTISING

Rates for advertising in the Classified Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

Plants for Sale

FOR SALE

To responsible parties, an attractive Gravel and Sand proposition, located twenty-five miles west of St. Louis, Mo., on the Merrimac River. Ideal railroad facilities. Unlimited market in St. Louis and adjacent territory. Very little competition. Gravel now selling in St. Louis at $2.20 per yard. Big outlet for production to contractors on roads on new $60,000,000 road bond issue in Missouri.

GEORGE L. FRAZIER
GLENCOE, MO.

FOR SALE

Silica Sand Crushing Plant, completely equipped, capacity 300 tons per day, 55 ft. Ledge white and buff silica sandstone. This plant is in first-class condition, has been in operation 10 years. Completed a new and up-to-date plant about a year ago. Have orders for entire output of plant, has operated winter and summer for past 10 years; best quality steel moulding sand; situated in Ohio; is a money-maker, and if sold quick will be sold at a bargain to someone interested in silica sand. Address

Box 1442 **Care Rock Products**

FOR SALE

Sand and Gravel Plant. All machinery in first-class condition; plant can be seen in operation. Address,

Box 1444 **Care Rock Products**

FOR SALE

1—Complete sand producing plant, including 300 acres of high grade sand rock producing 99.6% silica sand. Land is underlaid with thin seam of high grade coal. Can be purchased at a very reasonable figure, and should make an attractive proposition to anyone experienced in the operation of a plant of this kind. Address

J. C. EVANS
Fairmont, West Virginia

Plants for Sale

FOR SALE

An up to date stone quarry of 30 acres with complete No. 5½ Gates Crusher, No. 3 Gates Crusher and Sturtevant Pulverizer, all in first class condition and splendid territory to market Pulverized Limestone for agricultural purposes. Good reason for selling. A fortune to the right person. Correspondence solicited.

The O'Brein Stone Co.
E. M. Hamilton, Treasurer
Bellefontaine, Ohio

Valuable Texas marble property to let. Adjoin workings of old line company. Sending blocks of buff marble to all parts of United States and Canada. A safe proposition for strong company.

Box 122, San Saba, Tex.

Situations Wanted

POSITION WANTED

as superintendent in construction and operation of sand and gravel plant. Have had 20 years' experience. Also broad experience in long distance pumping and constructing pumping plants. Hold a pilot license on the Mississippi River. First class references will be furnished. Age 40 years. Address

Box 1446 **Care of Rock Products**

AT LIBERTY

Sand and gravel superintendent, twenty years with steam and electric equipment, centrifugal pumps, etc. Can design and build. Address

P. O. Box 62 **Silver Creek, N. Y.**

AN ENGINEER

of wide experience in large quarry management and operations is open for a permanent position, or work in consulting or advisory capacities. Can produce results and has a following of experienced quarrymen. Can produce tonnage and reduce explosive, drilling and operating costs by modern methods and efficiency. Address

Box 1449 **Care of Rock Products**

Help Wanted

WANTED

Experienced man to take charge of Hydrating Plant in Colorado. Must understand operating Clyde Hydrator and Raymond Mill. State experience and give references.

The Western Lime Company
422 E. & C. Bldg. **Denver, Colo.**

WANTED

Experienced Kiln Burners. Kilns 8x100 ft. and firing with fuel oil, 8-hour shift, dry process, pay satisfactory. Communicate with

Riverside Portland Cement Co.
Riverside, California

QUARRY OPPORTUNITY

Quarry producing crushed limestone desires competent man to invest $10,000 in the business and take entire charge of production of new plant. He will be entitled to interest in business and receive salary as superintendent. Must be experienced in handling crushing machinery, well drills, steam shovels, explosives, men, and able to supervise shipments. Quarry located in Pennsylvania, large output, plenty of labor, excellent market, P. R. R. siding. References required. Address

Box 1445 **Care of Rock Products**

WANTED

Field Engineer, between 30 and 40 years old; familiar with cement and plaster mill conveyor installations.

Bates Valve Bag Co.
7310 South Chicago Avenue, Chicago, Ill.

Miscellaneous

FOR SALE

Dolomite, limestone, dolomite beach gravel. Drummonds Island, Chippewa County, Michigan. For fluxing iron ores, refining wood pulp, concrete rock, road material, etc.

W. F. COOPER
Box 584 **Sault Ste. Marie, Mich.**

Have you a plant for sale?

Do you wish to purchase a plant?

Are you in need of a superintendent or manager?

Are you looking for a position as plant superintendent or manager?

Advertise your wants in these columns for quick results.

USED EQUIPMENT

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

Repaired Contractors' Equipment

Steam Shovels

Model 60 Marion Shovels, 2½-yard dippers, Nos. 1999, 2059, 2130

1—Model 1 Thew, on railroad trucks, ⅞-yard dipper.

1—Bucyrus Model 70-C, Shop No. 1219.

We have a large stock of thoroughly repaired Construction Equipment of all kinds ready for immediate shipment.

Locomotives

8—18-ton, 10x16" Porter Dinkeys, 36" gauge.
2—12-ton, 9x14" Porter Dinkeys, 36" gauge.
1—17x24", 55-ton, 4-6-0, standard gauge.
3—25-ton Forney type.

Clam Shell Buckets

1—1¼-yard Williams Hercules Bucket.

Cars

30—Western Air Dump 12-yard, standard gauge.
40—Western 4-yard, 36" gauge, steel beam.

H. KLEINHANS COMPANY
Union Arcade **Pittsburgh, Pa.**

FOR SALE

325 H.P. Extra Heavy Duty Corliss Engine. Excellent condition. Can be seen operating. Big bargain if taken at once.

LE ROY LIME & CRUSHED STONE CORPORATION
Le Roy, New York

Climax Geared Locomotive

40 ton, standard gauge, 12x14, completely overhauled, immediate shipment, cash or terms, located here., Also, 16x24, standard gauge, 35 ton, American type locomotive.

Lock Box 205 **Crown Point, Ind.**

Locomotives for Rent or Sale

2—50-ton 18x24-in. six-wheel switchers.
1—40-ton 17x24-in. four-wheel switcher.
2—18-ton and 14-ton 36-in. gauge Vulcans.
2—10-ton 7x12-in. 36-in. gauge Vulcans.
1—10-ton 36-in. gauge Shay geared.

Miscellaneous

1—Marion 76 steam shovel, No. 3503.
1—Monighan dragline, 120-ft. boom, 3½-yd. bucket.
100—60,000-lb. capacity box cars, 40 ft. long.
11—6-yd. dump cars, 4-ft. 8½-in. gauge.
12—1½-yd. "V" steel dump cars, 36-in. gauge.
1—Western standard gauge spreader.
2-in., 4-in., and 6-in. simple, duplex, and centrifugal pumps, 10-H.P. and 45-H.P. upright boilers, tripod drills, etc.

Railway Equipment, Etc.

INDUSTRIAL EQUIPMENT CO.
McCormick Building, Chicago, Ill.

WANTED

6-ft. or 8-ft. Hardinge Mill
Address
Box 1448 **Care Rock Products**

NO. 7½ AUSTIN
GYRATORY CRUSHER
Standard Drive

Complete with elevator and revolving screens. Condition excellent. Also

No. 5 Austin, standard drive, with 30-ft. elevator. Condition excellent.

Both plants thoroughly rebuilt, and can be shipped promptly. We also have many other bargains. Write us fully.

Reading Engineering Co., Inc.
1227 Tribune Bldg. **New York, N. Y.**

---

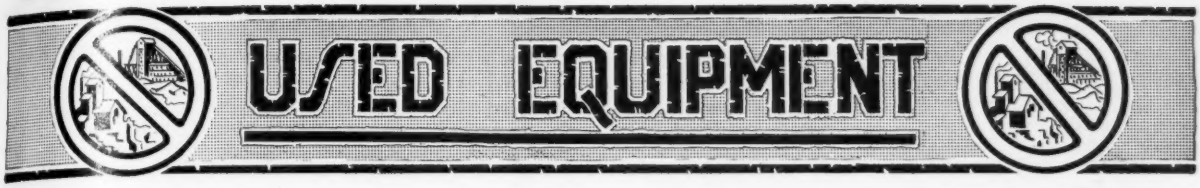
9 K CRUSHER

Regular Drive—Extra Fine Condition

35 H.P. and 112 H.P., A. C., Elec. Hoist NEW. 12 Steel Cars, 42-in. gauge, 7-yd. End Dump.

ROSS POWER EQUIP. CO.
INDIANAPOLIS, IND.

When writing advertisers please mention ROCK PRODUCTS



Machinery For Sale

DRYERS—Direct-heat rotary dryers 3x25 ft., 3½x25 ft., 4x30 ft., 5½x50 ft., 6x50 ft., and 7x60 ft., double shell dryers 4x20 ft., 5x30 ft., and 6x35 ft., steam-heated air rotary dryers 4x30 ft. and 6x30 ft.

KILNS—Rotary kilns 8x110 ft., 6x60 ft., 3½x25 ft., and 3x25 ft.

MILLS—8x8 ft., 6x5 ft., 2½x3 ft., 3x3½ ft., pebble mills; 8x8 ft. 6x6 ft., 5x4 ft., 4½x3½ ft., 2½x2½ ft. ball mills; 3 ft. Marcy mill; 42 in., 33 in., and 24 in. Fuller-Lehigh mills; 4½x20 ft., 5x11 ft., 5x22 ft., and 6x20 ft., tube mills; 7½x13 in., 9x15 in., 16x10 in., 20x6 in., and 30x60 in., jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; one Kent type "G" mill; 36 in. and 40 in. cage mills; 3 ft. and 4½ ft. Hardinge mills; 18x12 in., 20x12 in. and 30x10 in. roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 Sturtevant ring roll crusher; 3 roll and No. 000 and No. 00 Raymond mills; one No. 5 Telsmith breaker; one 36 in. Sturtevant emery mill; four Giant Griffin mills; one Junior Griffin mill; one 51x14 in. chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; one keystone excavator; 6x8 ft., 6x6 ft., and 4x3 ft. Newaygo vibrating screens, Richardson automatic scales.

Air compressors and tanks.

W. P. HEINEKEN, Engineer
95 Liberty Street, New York **Tel. Cortl. 1841**

Private Equipment for Sale or Rent

Byers Auto Crane, ¾ yd. clam shell.
Thew revolving shovel ⅜ yd.
8,000 ft. 24-in. gauge 20-lb. track.
Whitcomb gasoline locomotive 24-in. gauge, 3½ ton.
50 Koppel V-shape steel dump cars, 1¼ yd.
Derrick Car, standard gauge.
Sturdevant rolls, 20x14-in.
No. 5 Austin crusher, rear drive.
Keystone excavator, No. 3.
Jaw crusher, 9x16.
Bucyrus shovel, 65-ton, 2½ yd., mounted on railroad trucks (bargain).
35-ton locomotive, 16x24.
40-ton Climax, 12x14, geared locomotive, std. gauge.
7,000 ft. 2-in. black pipe.
Holt caterpillar tractor, 45 H.P.
3 steel trailers, 5 yd.
⅝ yd. Hayward orange peel bucket.
2 derricks (guy and stiff leg).
Porter locomotive 36-in. gauge, 6-wheel, 23-ton.
I own the above, will sell, or rent to responsible party.

Daniel B. Straley, Crown Point, Ind.

PRODUCERS—Keep your eyes on the Used Equipment pages of

ROCK PRODUCTS

for your requirements of second hand machinery

Machinery Men—Advertise your equipment here for quick turnover

Shovels, Locomotives, Cars and Cranes

Bucyrus, 40-ton, 1½ yard.
Bucyrus, 70-ton, 2½ yard.
Osgood Model 18, Traction, ¾ yard.
Marion Model 28, Traction, ¾ yard.
Thew Model O, Traction, ¾ yard.

LOCOMOTIVES

American, 30-ton Std. Gauge Saddle Tank.
Baldwin, 35-ton Std. Gauge Saddle Tank.

CARS

10 Western 12-yd. Std. Gauge.
48 Kopple 1¼-yd. 24 Gauge, Illinois Delivery.

LOCOMOTIVE CRANES

Osgood Model 29, Std. Gauge.

Clam Shell, Orange Peel, and Drag Line Buckets

Blaw Knox, one and two yds. Cap. Clam Shells.
Owen, 1¾ yds. Cap. Clam Shells.
Williams, 2 yds. Cap. Clam Shells.
Smith, ¾ yd. Cap. Orange Peel.
Hayward, 1 yd. Cap. Drag Line.
Page, 1 yd. Cap. Drag Line.
Some of the above items are new.

A. J. O'NEILL CO.
Weightman Bldg. **Philadelphia, Pa.**

The Fuller Engineering Co.

Designing, Constructing and Operating Engineers

Analytical Chemists

Cement and Hydrated Lime Plants a Specialty

Offices: Allentown National Bank Building
ALLENTOWN, PENNSYLVANIA

Robert W. Hunt **Jno. J. Cone** **Jas. C. Hallsted** **D. W. McNaugher**

ROBERT W. HUNT & CO.

Inspection—Tests—Consultation

Inspection New and Second Hand Machinery, Pumps, Crushers, Steam Shovels, Cars, Locomotives, Rails and Quarry and Contractors' Equipment

INSPECTION AND TESTS OF SAND, GRAVEL, CEMENT, STRUCTURAL STEEL, CASTINGS AND CONSTRUCTION MATERIALS

Cement, Chemical and Physical Testing Laboratories

New York **CHICAGO** **Pittsburgh**
St. Louis **Kansas City** **Cincinnati** **San Francisco**

F. L. SMIDTH & CO.

50 CHURCH STREET **NEW YORK**

Engineers

CEMENT MANUFACTURING PLANTS
CEMENT MAKING MACHINERY
PULVERIZED COAL INSTALLATIONS
GRANULATING AND PULVERIZING MACHINES FOR ALL MATERIALS
FLINT PEBBLES—SILEX LINING
THE LENIX BELT DRIVE

James N. Hatch, C. E., M. E.

Member A. S. C. E.

CONSULTING ENGINEER

500 Old Colony Bldg., Chicago

Designs and Constructs

Complete Sand and Gravel Screening and Washing Plants.

Stone Crushing and Storage Plants. Conveying Systems. Contractors' Material Plants

Electric Generating Plants and Transmission Lines.

Estimates and Plans Furnished

THE SCOOP CONVEYOR

THOUSANDS IN USE

FOR STORING AND RECLAIMING
LOADING AND UNLOADING
CARS, TRUCKS AND WAGONS
SAVES 6 TO 12 MEN
SAVES CAR DEMURRAGE
ELIMINATES SHOVEL AND WHEELBARROW WORK
KEEPS EQUIPMENT MOVING

WRITE FOR CATALOGUE

PORTABLE MACHINERY CO., PASSAIC N.J.

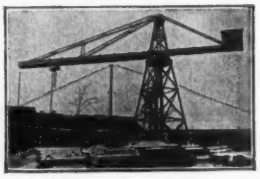
WEBSTER

Elevating and Conveying Machinery

For rock, ore, coal and grain handling and for the movement of materials in bulk or packed. Literature and engineering estimates on request.

WEBSTER MFG. CO.
4500 Cortlandt St. CHICAGO, ILL.
Factories: Tiffin, Ohio, and Chicago.

Locomotive Cranes



Special Cranes

Rotating Tower Cranes

Any Size or Capacity. Hand or Electrically Operated.
Stationary or Traveling.
Let Us Know Your Requirements

The American Crane & Engineering Co.
Toledo, Ohio

Robins Conveying Machinery

is handling limestone, clinker, cement in bulk and in bags, gypsum, sand, gravel, crushed stone and many similar materials. Write for a copy of the Robins Handbook of Conveyor Practice and learn more about the Robins System.

Robins Conveying Belt Company
Park Row Bldg. New York City

Chicago, Ill., Old Colony Bldg. Pittsburgh, Pa., Union Arcade Bldg.
San Francisco, Cal. The Griffen Co., Holbrook Bldg. Birmingham, Ala. C. B. Davis Eng. Co., Brown Marx Bldg.
Salt Lake City, Newhouse Building

BROWNING LOCOMOTIVE CRANES

"The All-Around Champions"

BROWNING
"Buckets That Bite"

Both are time and money savers

Write for Catalogs

THE BROWNING CO.
Cleveland, Ohio
Sales Offices:
New York Chicago

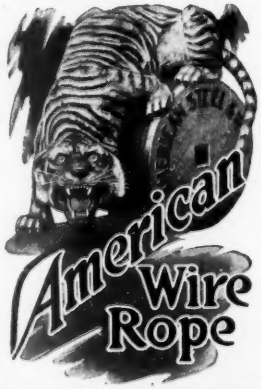
SCREENS of All Kinds

Chicago Perforating Co.
2445 West 24th Place
Tel. Canal 1459 CHICAGO, ILL.

PERFORATED SCREENS

MADE TO SUIT YOUR REQUIREMENTS
Let Us Quote Prices
Service and Quality

NORTMANN-DUFFKE CO
1200 27th Avenue Milwaukee, Wis.



for elevators, dredges, lumbering, mining, oil-well drilling, suspension bridges, stump pulling, cranes, derricks, ships' rigging and every other form of wire rope use

Illustrated Catalogue —Free

American Steel & Wire Co.
Chicago New York

OSGOOD 29 1 YD TRACTION REVOLVING STEAM SHOVEL

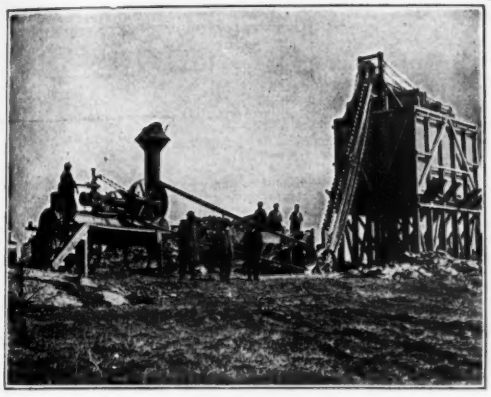
Whether it is to meet the requirements of quarry work where the largest crushers are used, for handling ores where large capacity is required, for excavating shale, etc., without blasting or for the general every day use in construction work, you buy the greatest amount of satisfaction in every way when you buy an OSGOOD—Large or Small.

We willingly help you solve your excavating problems in a way that will materially reduce yardage cost.

Write today for copy of our General Catalog C-1.

Revolving and railroad type ¾ to 6 cu. yds.

The OSGOOD COMPANY
MARION, OHIO



COMPLETE INSTALLATIONS
For Stone Quarries or Lime Plants

We are prepared to build and superintend the installation of all equipment necessary to start operations.

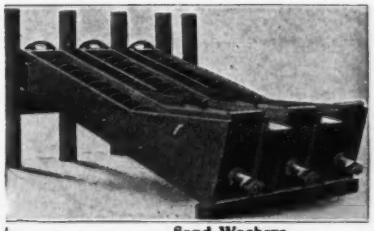
Reliance Products are equal to the best and we know that our engineers can save you money by their recommendations. Prompt deliveries.

Let Us Quote You Prices

Universal Road Machinery Co.
Kingston, N. Y.
Reliance Quarry and Road Building Equipment

The Advance Engineering Company
Cleveland, Ohio
The "ADEN" Crane and Bucket
Special Interest to Sewer Contractors and Special Excavation Problems

E. 140 St. Sewer, Cleveland, O., — 34-Yd. Heavy Bucket being used



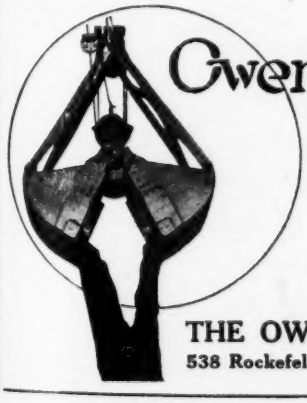
Sand Washers

9-Foot Dry Pan

Lewistown Foundry & Machine Co.
LEWISTOWN, PA.

Builders of heavy duty crushers and glass sand machinery. Glass sand plants equipped complete.

Write for prices and catalog

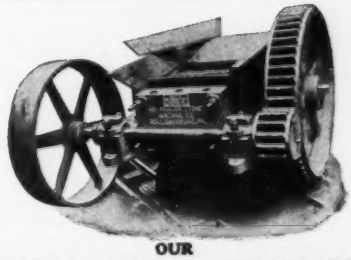


Owen Buckets

combine dollar-saving features of bucket construction which are illustrated in our latest catalogue.

Write for it today.

THE OWEN BUCKET CO.
538 Rockefeller Bldg., Cleveland, Ohio



OUR
SINGLE ROLL CRUSHER

is as simple as can be. Is easily fed, makes less fines than either a Gyratory or Jaw. Capacity 5 to 500 tons per hour. For crushing Limestone, Dolomite, Hard Rock Phosphate, Cinders, etc. Screens of all descriptions. Washers for dirty stone.

Ask for Information
McLANAHAN-STONE MACHINE CO., Hollidaysburg, Pa.

The House of Dependable Service

HYMAN-MICHAELS COMPANY

Peoples Gas Building

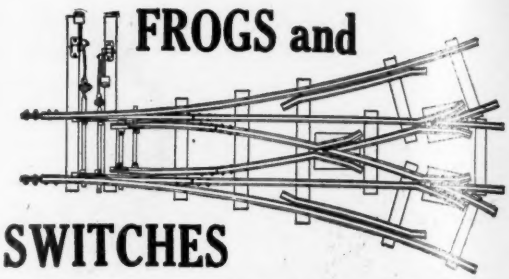
CHICAGO

NEW AND RELAYING RAILS

BRANCH OFFICES

New York, N. Y. 1324 Woolworth Bldg.
Pittsburgh, Pa. 1313 1st National Bank Bldg.
St. Louis, Mo. 2115 Railway Exchange Bldg.

FROGS and SWITCHES



The Central Frog & Switch Co., Cincinnati, O.

Frogs, Switches, Crossings, Switch Stands, Rails, Angle Bars, Fishplates, Throws, Rail Braces, Tie Plates, Portable Track, Etc., Etc.

"Hercules Solid Weld" Steam Shovel Chains

Best In the World. Will Actually Wear Out

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Columbus, Ohio

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FULL CIRCLE CRANES. "EQUIPMENT THAT LASTS." TIMBER & STEEL DERRICKS.

LET US SOLVE YOUR MATERIAL HANDLING PROBLEMS.

Steel and Timber DERRICKS **TERRY**

We Design and Equip Complete Plants

for the manufacture of gypsum products, such as wall plaster, moulding plaster, wall board products, gypsum block products, also mixing plants.

We are prepared to furnish complete machinery-equipment and design and furnish plans for the installation. Consult our Engineering Department. Forty years' experience in designing of wall plaster machinery and plants.

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Engineers, Machinists and Founders

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Designer and Construction Engineer

Of Stone Crushing Plants, Conveying and Storage Systems, Quarry Operations, Rotary Lime Kilns, etc.

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For Mortar, Cement and Brick—
Brown, Black, Red and Buff
—Strongest and Most Durable

Manufactured by

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Correspondence Solicited EASTON, PA., U. S. A.

PORTER LOCOMOTIVES

STEAM & COMPRESSED AIR

WRITE FOR CATALOGUE

H. K. PORTER Co.

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GEAR AND FRICTION DRIVEN GASOLINE LOCOMOTIVES—2½ TO 25 TONS ON DRIVE WHEEL

WHITCOMB LOCOMOTIVES

IT WILL PAY YOU TO GET OUR PROPOSITION BEFORE YOU BUY

GEO. D. WHITCOMB CO.

MAIN OFFICE AND WORKS

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STORAGE BATTERY LOCOMOTIVES—1 TO 8 TONS ON DRIVE WHEELS

The Kritzer Continuous Lime Hydrator

Hydrating Lime

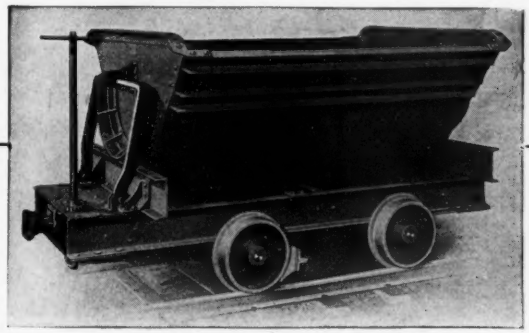
97% of Hydrated Lime is made either by the Old or by the New Kritzer Process. We Guarantee to manufacture the Best Product at the Lowest Possible Cost. Our engineers have worked out every practical improvement in use today in hydrating lime.

It is our business to solve your problems.
It is our business to investigate thoroughly the conditions that prevail at every plant, to work out all the details and to build a plant that will prove a success from the start.

We assume the Responsibility. Now is the time for you to act. Take the matter up with us NOW and we will outline your whole proposition for you.

THE KRITZER COMPANY

503 South Jefferson Street CHICAGO, ILL.



More Than Reinforced

Reinforcing a dump car makes it stronger, of course. But there is a best way to reinforce. Atlas cars are reinforced the best way. Why? Simply because we have built dump cars so long and for so many people that we know just where the reinforcing should go and just how it should be done.

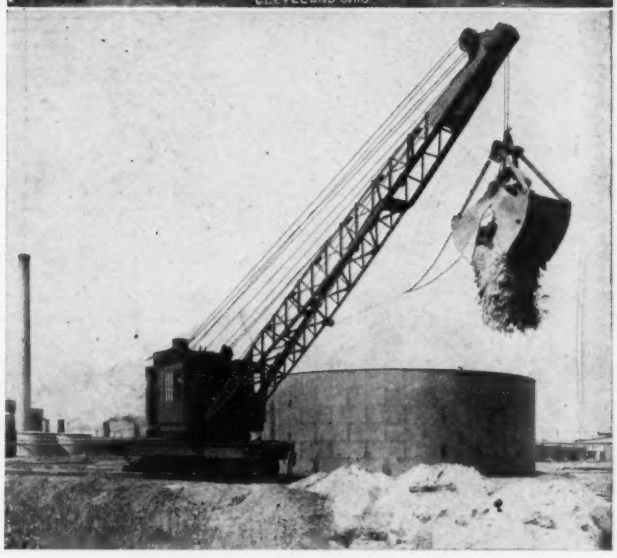
Not much wonder, then, that Atlas dump cars stand the "gaff" better than the average.

The Atlas Car & Manufacturing Co.

ENGINEERS MANUFACTURERS

CLEVELAND, OHIO, U. S. A.

LOCOMOTIVE CRANES
CLAM SHELL BUCKETS - SHIPBUILDING CRANES
CAR DUMPERS PILE DRIVERS
THE McMYLER INTERSTATE CO.
CLEVELAND OHIO



A CRANE WITH A RECORD FOR SPEED

A McMyler Interstate Type "B" Crane, equipped with a McMyler Interstate Clam-Shell Bucket, made a record of 13 trips in 3 minutes, swinging at 90° each trip. The speed is important, but the fact that the crane will stand up under continuous service such as this is more important. The first cost of a crane is of little importance if a large percentage of return is insured. Greater speed, consequent greater capacity, together with low maintenance cost, make the Type "B" one of the best "buys" on the market.

The McMyler Interstate Co., Cleveland, O.

BRANCH OFFICES:

New York—1756 Hudson Terminal Bldg. Seattle ——— Hoge Bldg.
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Chicago ——— 812 Edison Bldg.

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CANVAS BELTING

Every piece of Hettrick Canvas Belting that leaves our plant must be worthy of the seal it bears, and the careful inspection it receives insures the user of a high grade, full weight belt. Quality is built right into every foot of Hettrick Belting.

THE HETTRICK MFG. CO.
TOLEDO, OHIO

Service Quality Satisfaction

BATES
WIRE TIES

for tying reinforcement in concrete construction

Ties all kinds of reinforcement effectively —mesh, bars, metal lath, expanded metal. Also used in the manufacture of concrete pressure pipe and sewer pipe.

A handy tool which means efficiency and speed to the workman—a money saving device to the contractor.

Write for illustrated price list.

We also make the Bates Packer for packing cement, ground limestone, etc.

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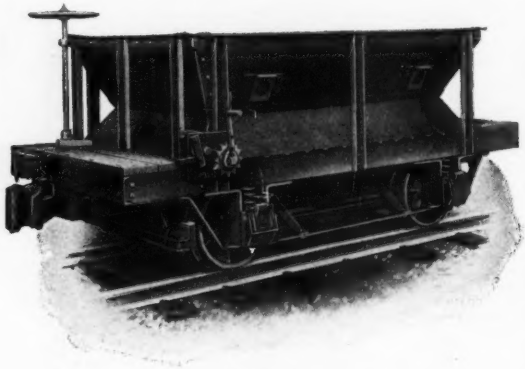
7310 South Chicago Avenue
CHICAGO, ILL.

W. I. 110 Great Portland St., London, Eng.



No. 138-R

WATT CARS

We have devoted years to the study of cars for your requirements, and now offer free our engineers' expert judgment in solving your problems.

CARS—every type—that's all we make.

The Watt Mining Car Wheel Co.
Barnesville, Ohio

Universal Crushers

The biggest value for your money. Universal crushers and pulverizers reduce stone to desired size or fineness in a jiffy!
Fifteen years of designing and building experience have made possible the exceptional ability of Universals.

Universal Crusher Co.
225 Third Street
Cedar Rapids, Iowa, U.S.A

Ask for Folder 1918

The Clyde Lime Hydrator Performance Counts

The Clyde was first in the field, and through dependable and economical performance is still first choice of lime operators.

The Clyde Hydrator produces big capacities of lime at only three-fifths the cost of any other hydrator on the market.

The Clyde not only produces over 90% of the hydrate of America, but makes the best quality of finishing lime from either high calcium or magnesium.

Simple, easiest to operate and most economical in cost of installing, maintaining, and operating.

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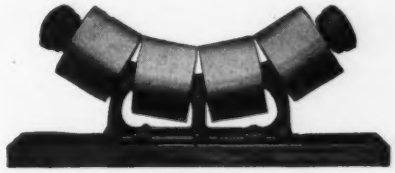
Patentee and Sole Manufacturer
DULUTH - - MINNESOTA



CALDWELL Belt Conveyors

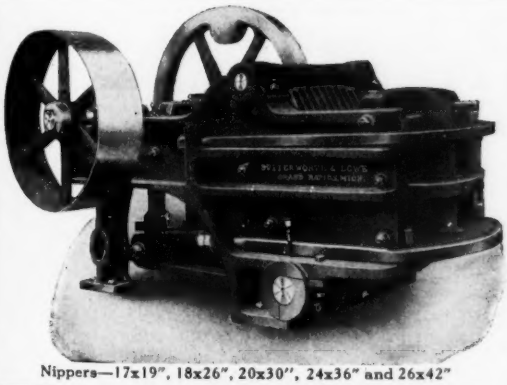
Simple—Economical

will solve your handling problem. Simple in design, economical of power, they give the utmost satisfaction. Our forty years' experience has made us thoroughly familiar with the many details of construction necessary to success.

A rough sketch showing the conditions to be met at your plant will bring our recommendations. We should also know the capacity desired and the power available.

Get Catalog No. 38

H. W. Caldwell & Son Co.
Elevating, Conveying and Power Transmitting Machinery
Chicago 17th Street and Western Avenue
50 Church Street New York, N. Y.



Nippers—17x19", 18x26", 20x30", 24x36" and 26x42"

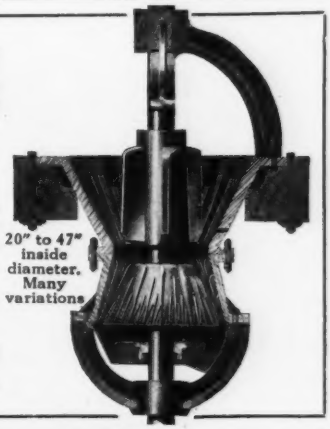
JAW & ROTARY CRUSHERS

For All Rocks and Ores Softer Than Granite

GYPSUM MACHINERY—We design modern Plaster Mills and make all necessary Machinery, including Kettles, Nippers, Crackers, Buhrs, Screens, Elevators, Shafting, etc.

Special Crusher-Grinders for Lime

Butterworth & Lowe
17 Huron St. Grand Rapids, Mich.

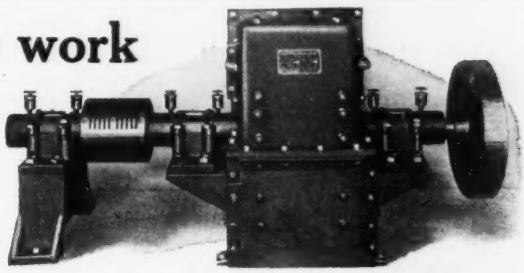


20" to 47" inside diameter. Many variations

By the very nature of the work

it is called upon to perform a pulverizer must be much stronger than the material it handles.

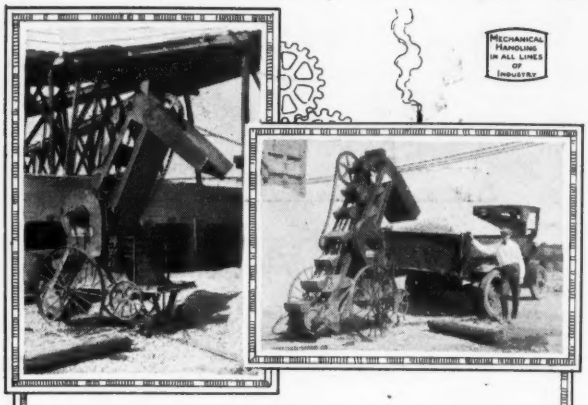
Only STEEL will stand the stress
"K-B" is built ALL-Steel



Catalog with full particulars on request

K-B PULVERIZER COMPANY, Inc., 92 Lafayette St. NEW YORK

K-B PULVERIZER

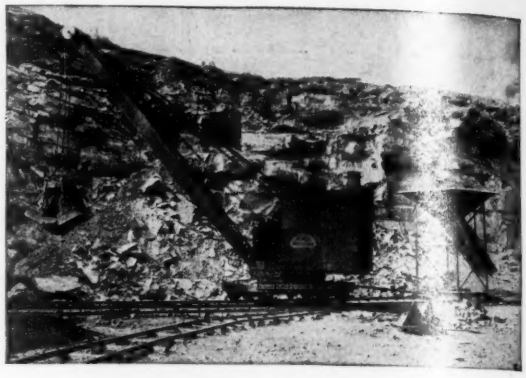


GIFFORD-WOOD Wagon Loaders handle loose materials of all kinds at the lowest cost per ton. They have proven their efficiency and their serviceability.

If you are interested in Screens of any kind or Conveying Machinery write for our catalog, or better still, let us know your problem. We will gladly submit a plan.

Gifford-Wood Co.

NEW YORK CHICAGO MAIN OFFICE AND WORKS HUDSON, N.Y. BOSTON BUFFALO



O. S. DEPENDABLE Locomotive Cranes

reduce expenses of handling materials, increases profits and output wherever installed. Catalog No. 16 contains valuable information and is mailed upon application.

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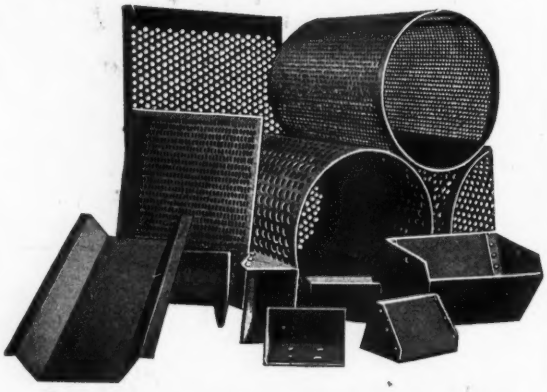
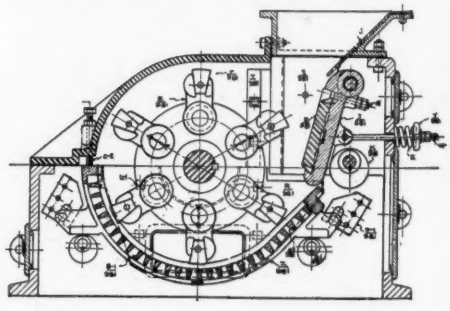
ORTON & STEINBRENNER CO.
Chicago, Ill.
Factory—Huntington, Ind.

Perforated Metal Screens
FOR
Stone, Gravel, Sand, Etc.



ELEVATOR BUCKETS
PLAIN AND PERFORATED
General Sheet and Light Structural Work
Hendrick Mfg. Co.
CARBONDALE, PA.
New York Office, 30 Church Street

THE KENNEDY
Swing-Hammer Pulverizer

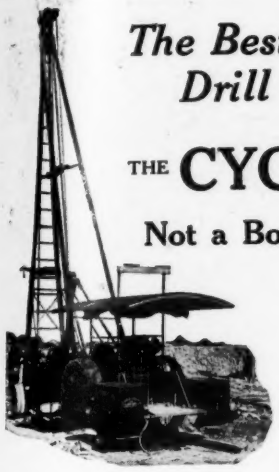


A Mechanically Perfect Device

The Kennedy Swing-Hammer Pulverizer embodies mechanical improvements heretofore considered unattainable. Reversible, renewable hammer tips and breaker plates of alloy steel. Impact pulverizing—no grinding movement. Adjustable steel grid—so controlled as to permit adjustment while machine is running. Automatic lubrication. Ball and socket bearings—in short, every possible improvement tending toward efficiency, durability and low maintenance expense.

Send for full description

Kennedy Van Saun Mfg. & Eng. Corp.
120 Broadway **New York**



The Best Blast-Hole Drill on Earth

THE **CYCLONE** No. 14

Not a Boast—A FACT

We will prove the superiority of the No. 14 Drill by placing one of the outfits in your quarry against any or all other makes.

If the Cyclone doesn't out-drill and out-wear all other drills, we will remove it from the work without cost to you.

Our proposition gets below the paint—it eliminates talking points and evaporates hot air. It puts buying on a strictly engineering basis where it belongs.

Furnished in Steam, Gasoline, Compressed Air or Electric Power Traction or Non-Traction

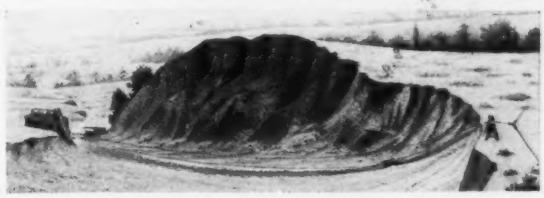
Let us send you full particulars

The Sanderson-Cyclone Drill Co.

ORRVILLE, OHIO

Eastern and Export Office 1778 Broadway, New York

A Labor-Saver *For Small Gravel Pits*



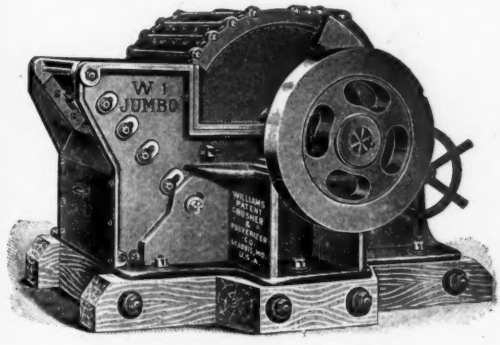
CONSERVATIVE claims for the smallest sizes of Sauerman Bottomless Power Scrapers, based on the statements of contractors and county road commissioners who are using them, are that a Sauerman scraper operated by one man will displace from 6 to 15 teams and slip scrapers. The larger sizes of Sauerman scrapers are considered by the commercial gravel producers who use them as being the equal of a small steam shovel with the added advantage that they will not only dig, but also convey the sand and gravel to the plant.

One road superintendent in Michigan who installed one of our ⅓ cu. yd. scrapers in the county gravel pit last Summer, writes in to say that it is saving the county $40.00 per day while doing the work that formerly called for a half dozen teams and scrapers.

A Wisconsin sand and gravel producer chose a Sauerman scraper in preference to any other type of equipment when he opened his first gravel pit about six years ago. Today he owns and operates four gravel plants and the excavating and conveying equipment is the same at all—Sauerman Bottomless Power Scrapers.

The many advantages of this one-man operated, combined excavator and conveyor are explained in our Pamphlet No. 10, with illustrations and diagrams of actual installations.

Sauerman Bros., 1140 Monadnock Block, Chicago



Williams Crushers

Williams Jumbo Crushers are used in quarries as secondary crushers, taking 10-inch and under limestone, as it comes from the primary crushers, and reducing the material to 1½-inch, 1¼-inch or 1-inch and under in one operation. These machines are built in capacities ranging from 30 tons to 300 tons per hour. Many are now in operation. Complete details concerning these crushers are found in bulletin No. 4-B.

WILLIAMS HINGED HAMMER **PATENT CRUSHER AND PULVERIZER COMPANY** ESTABLISHED 1871

Plant & Offices 2701 N. Broadway St. Louis, Mo.

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"Perfect" Concrete Power Block Machine

Also Hand and Power Brick Machines
Hand Block Machines
Well, Cistern and Silo Molds

C. S. WERT, Inventor and Patentee

GEARLESS—NOISELESS

This Power Block Machine, equipped with a one-horse power motor or 2½ H.P. gas engine, and three men will manufacture 1,000 blocks in ten hours.

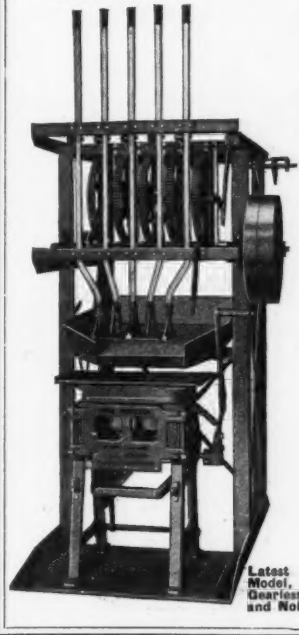
Earn $100 daily with this machine. The opportunity to get in on the ground floor of an industry that is growing with tremendous speed is here.

Get the "Perfect" Line of Concrete Machines and start now.

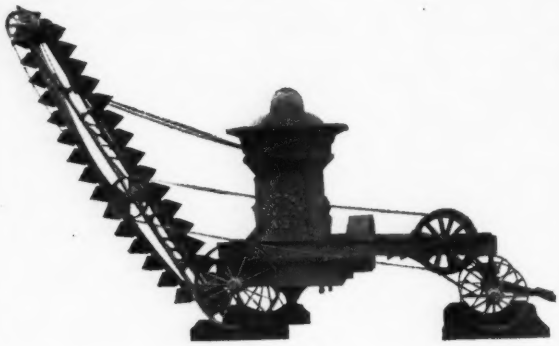
Manufactured by

The Wert Mfg. Co.

547 Railway Exchange Bldg.
Chicago



Latest Model, Gearless and Noiseless



AUSTIN
Portable Gyratory Crusher

THE universal success of the Austin Portable Gyratory Crusher is attributable to its remarkable strength and capacity plus the ease with which it can be moved from place to place as the work progresses. It is portable!

The crusher is mounted on a strong steel I beam frame, with heavy wheels and tires of ample width. The delivery spout from the crusher is to the rear, affording the best possible means for attaching the elevator to the truck.

Construction of truck is such that the bottom plate can be dropped, and the eccentric may be easily removed when necessary to rebabbitt it.

Write today for Catalog 28 and complete data.

We build stationary plants 50 to 5000 tons daily capacity

Austin Manufacturing Co.
CHICAGO

New York San Francisco

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Mussens Limited, Montreal, Toronto, Winnipeg, Vancouver

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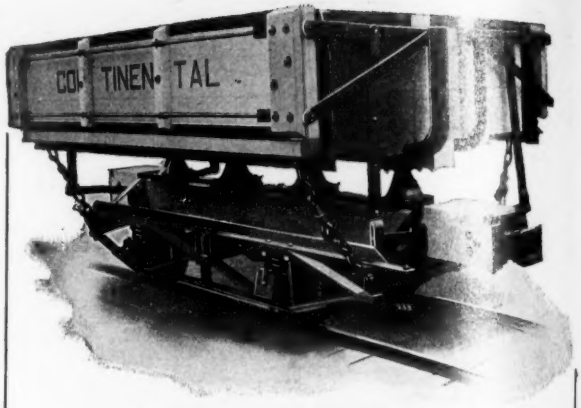


Built stronger to wear longer

TRIPLY EFFECTIVE—
—is the Continental Dump Car due
—to its basic construction, its
—over-strength and its ruggedness.

LET US HELP YOU—
Continental Dump Cars will do it.

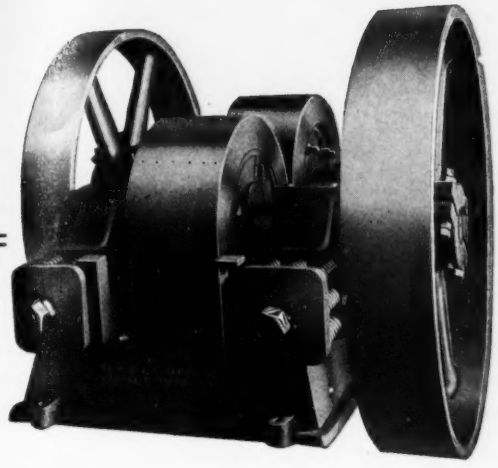
Continental Car Co. of America
Incorporated
Louisville, Kentucky

OHIO
LOCOMOTIVE CRANES

When the proportion of steel castings in a crane run up to 90%, it means the possibility of breakage is reduced to a minimum. This **Exclusive** feature of the "OHIO" crane means speed, economy and durability to a degree impossible to obtain in any other crane.

Ask us to show you an Ohio at work

Ohio Locomotive Crane Co.
Poplar Street **Bucyrus, Ohio**



When you are in the market for Transmission Equipment, Screens, Elevator Buckets or Crushers, and want the best that can be had irrepective of price.

Write for Descriptive Literature

WEBB CITY & CARTERVILLE FOUNDRY & MACHINE WORKS
WEBB CITY, MISSOURI

Many Notable Improvements Characterize THE "American" Gearless Blast-Hole Drill

While the normal speed of drilling is 50 strokes a minute, this machine will jump the tools smoothly at 60 strokes, handling with ease a 4-in. diameter by 20-ft. length drill stem equipped with bit and socket weighing from 1100 to 1200 lbs. and drilling 5¾-in. or 6-in. holes.

The spudding beam is attached to the crank in such manner that it gives a quick, hard stroke of drill at a speed of 50 or 60 r. p. m., with a minimum of whipping of cable.

No clutches on the machine; the crank is keyed fast to the crank shaft, and the tools are always the full length of the stroke off the bottom when stopping, permitting them to start on the down stroke with engine or motor at full speed without backing up.

Description on Request

The American Well Works Aurora, Illinois

Conveyor, Loading, Steam Shovel, Dredge, Crane, Quarry and Hoisting Chain

UNITED STATES CHAIN & FORGING COMPANY
Union Arcade *"As Good as the Name"* Pittsburgh, Pa.

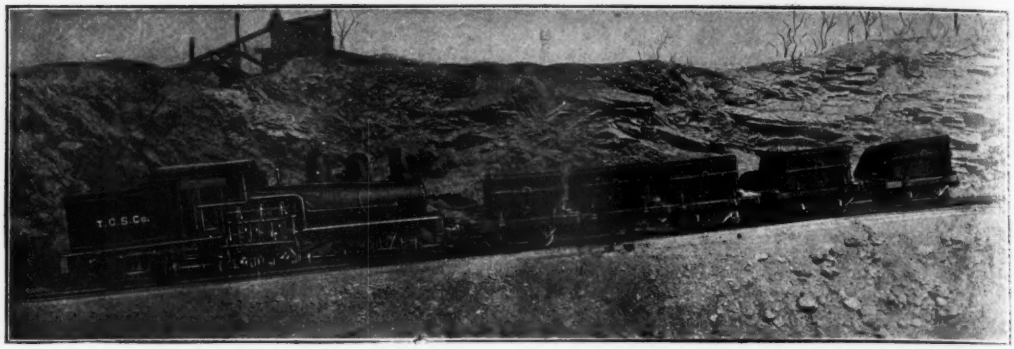
PERFORATED STEEL SCREENS

The success of any house supplying repair and renewal parts depends on furnishing what is needed quickly and correctly, and of satisfactory quality.

Sixteen years in the Perforated Metal field have given us the experience, equipment and technical knowledge, and three hundred tons or more of Steel Plates and Sheets enable us to fill rush orders promptly.

Try us with your next order.

Cross Engineering Company, Offices and Works, Carbondale, Pennsylvania



Keep Them Moving

"Shay" engines are especially adapted to uneven track.

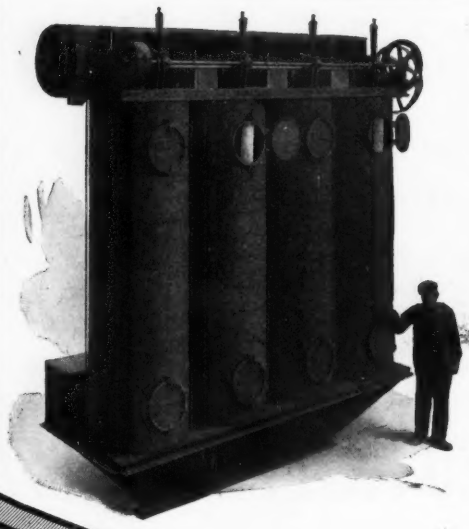
Every wheel is a driver—there is no slipping at bad spots as with a rod engine.

"Shays" keep your rock moving, so that there is uninterrupted output.

The kind of service they give is the kind that produces largest net profits.

LIMA LOCOMOTIVE WORKS, Inc.

LIMA, OHIO **30 Church St., New York**



Allis-Chalmers Dust Collectors

Have you a dust Problem?

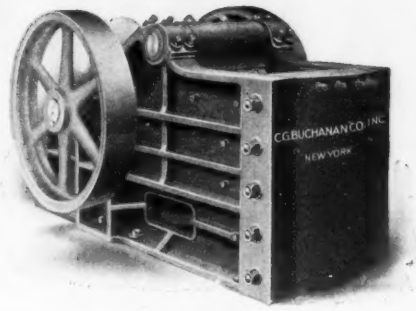
If so it will be to your advantage to let us study the conditions in your plant. We design and equip dust collecting systems to meet your particular conditions.

Write for Bulletin 1454.

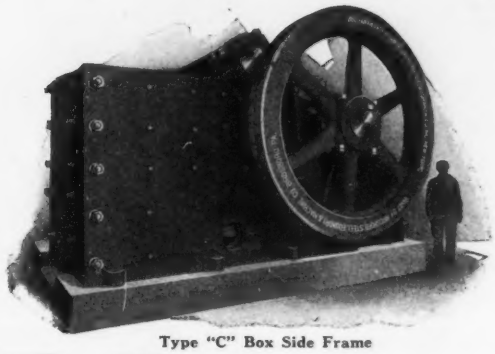
ALLIS-CHALMERS

MILWAUKEE, WIS. U. S. A.

When YOU Think of Buchanan—Think of Crushers



Type "C" Panel Side Frame



Type "C" Box Side Frame

BUCHANAN JAW CRUSHERS

ALL STEEL PATENTED

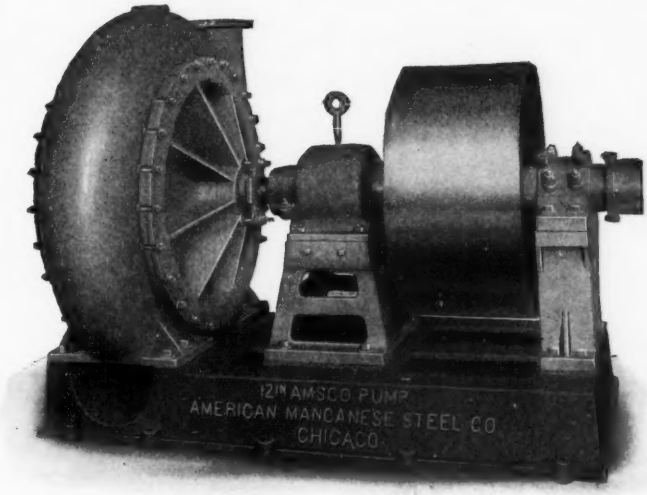
are MADE of the same material with which other crushers are reinforced. ALL our crushers, whether of the "Panel" or "Box" side frame types, are built throughout of the best quality, thoroughly annealed, heat treated, open hearth steel, which combined with the infinite care of Buchanan design and construction, accounts for their greater length of service and higher crushing efficiency. There is a size best suited for your crushing. Get our Bulletin No. 10 and get posted on how you can have the maximum of crushing at the minimum cost.

C. G. BUCHANAN CO., INC., 90 West Street, New York

Crushing Machinery, Crushing Rolls, and Magnetic Separators

When You Think of Crushers—Think of Buchanan

AMSCO SAND AND GRAVEL PUMPS



AreDependableProducers

Save delays
More operating days
Lowest cost per yard pays

Built of rugged construction for hard service. Shell, side plates and runner—parts exposed to abrasive wear and constant grinding action—are made of manganese steel.

Extra heavy shaft, sturdy bearings, ball bearing thrust collar and well balanced runner, make the AMSCO pump a smooth-running and efficient machine.

AMSCO Flap Valves, Pipe and Elbows

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Pacific Coast Office: Insurance Exchange Bldg., San Francisco, California
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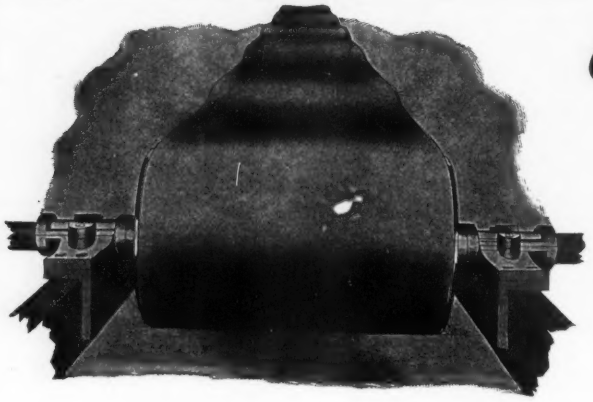


"ARNO" CONVEYOR BELTING

Reduces Your Cost of Handling to a Minimum

Arno Conveyor Belts are manufactured to render unusually long and satisfactory service.

Made of a combination of duck, friction and extra cover stock, they are especially constructed for carrying ores, broken stone, sand, gravel, etc.

Write for Catalog and Information

CINCINNATI RUBBER MANUFACTURING CO.

Makers of Belting—Hose—Packings and Molded Specialties

CINCINNATI, OHIO, U. S. A.

IF you are building a gas house, put in the most efficient and economical equipment—Chapman Stationary Gas Producers with Floating Agitators and Automatic Coal Feed. If you are struggling with old hand-poked producers, you can increase their efficiency (70% on labor and 20% on fuel) by installing Chapman Agitators and Automatic Coal Feed.

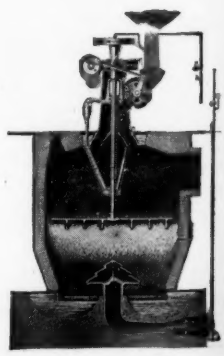
Proof of what Chapman Service will mean to you will be sent if you ask for it. Or, one of our Engineers will be glad to call on you and discuss your gas problems.

The CHAPMAN ENGINEERING CO.

C&G *Division of The* COOPER CO.

MT. VERNON, OHIO

11 Broadway, N. Y. Oliver Bldg., Pittsburgh



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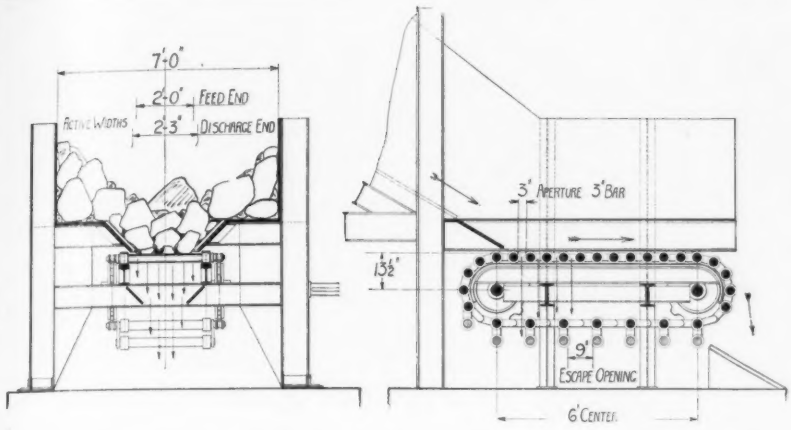

ROSS

Automatic Drop-Bar Grizzly-Feeder

Travelling Apron Type
Patented

is **Fool-Proof**
needs less **Horse Power**
has less **Wear**

The Ross Automatic Drop-Bar Grizzly-Feeder will not BLOCK or CHOKE. It will feed and screen the largest run of mine material—at an even rate for twenty-four hours a day without attendance.

Made in a variety of lengths with apertures from 12-in. down to ½-in.

The aperture of the returning apron is increased so enormously that the fines have free passage downward. The bars are made of solid mild steel or manganese steel to suit requirements.

Submit your problems to

ROSS ENGINEERING CO., Department T.
Old Colony Building, Chicago, Ill.
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USE

Cordeau-Bickford
Detonating Fuse

For well drill blasting and the tunnel and pocket method of blasting, where large quantities of explosive are to be detonated, use safe, efficient Cordeau-Bickford and get lower blasting costs.

The Ensign-Bickford Co., Simsbury, Conn.
Established 1836 Original Makers of Safety Fuse

ECONOMICAL STORAGE

For storing limestone, bulk lime, sand or for glass batch bins, no construction is as economical as the Preston-Lansing Storage Bins. Their first cost is moderate. There is no other cost—no painting, no repairing, no rebuilding, no upkeep of any kind. They are everlasting.

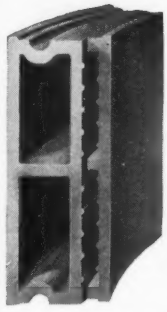
And Preston-Lansing Bins give greater satisfaction every day of their long, long life. They are proof against moisture, fire, rot and rust. Their great strength withstands more than any normal requirement.

Write for the names of other satisfied owners and for full information. Not the slightest obligation.

J. M. PRESTON COMPANY
Dept. 416 Lansing, Mich.

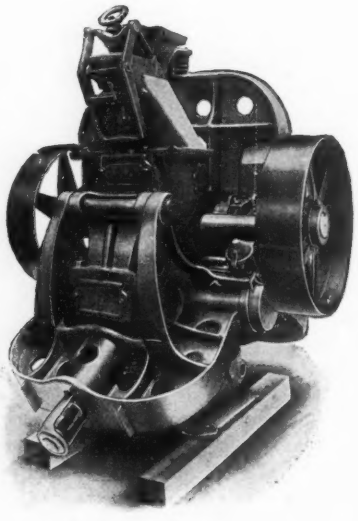
Factories: New Brighton, Pa.; Uhrichsville, Ohio; Brazil, Ind.; Ft. Dodge, Iowa.

Preston Lansing



Preston-Lansing Vitrified Tiles are braced against each other in "ship-lap" formation and reinforced between each tier by a twisted steel bar embedded in a thick layer of concrete.

50 by 20 Pulverized Limestone Storage, Bessemer Limestone Co., Youngstown, O.



MAXECON MILL

Preliminary Grinder for Tube Mills

LIMESTONE .....20 to 40 Mesh
CEMENT CLINKER .....20 to 60 Mesh

MAXECON MILL
PERFECTION SEPARATOR

The UNIT that has LARGER OUTPUT with LESS POWER WEAR and ATTENTION than any other.

It will be to the interest of those who operate CEMENT PLANTS to know what the Maxecon Unit will do.

Drop us a line **We will be glad to tell you about it**

Kent Mill Company

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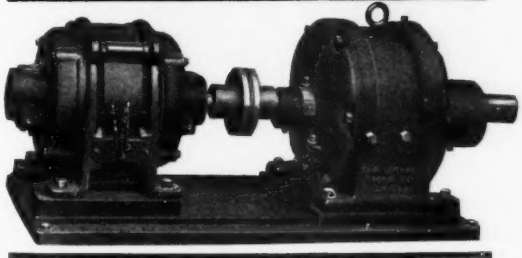
S-A GRAVEL WASHING and SCREENING EQUIPMENT

S-A Gravel Washing and Screening equipment is designed to do the work quickly, thoroughly and with a minimum cost for maintenance. The cost of labor with S-A Gravel Plants is unusually low, because the operation is largely automatic. S-A engineers are at your service—ready to help you—and they thoroughly understand gravel work.

STEPHENS-ADAMSON MFG. CO.
AURORA ILLINOIS

James Speed-Reducing Transmissions



save space and save power. They are compact and easy to install. They are dust-proof and fool-proof. In cement, stone, and lime plants, where space is at a premium, and where dust conditions are unusually severe, James equipment for reducing motor speed appeals to the plant engineer. The power is delivered more economically and with less strain on the motor.

Any reduction of speed from the ratio of 4:1 to 1600:1 can be furnished.

Our engineering service is ready to assist you in definitely solving your problems connected with the economical delivery of power by direct connected motors.

Send for our latest bulletin, No. 7

D. O. James Mfg. Co.
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Provide Operating Economy

SCHAFFER
Continuous Lime Hydrators

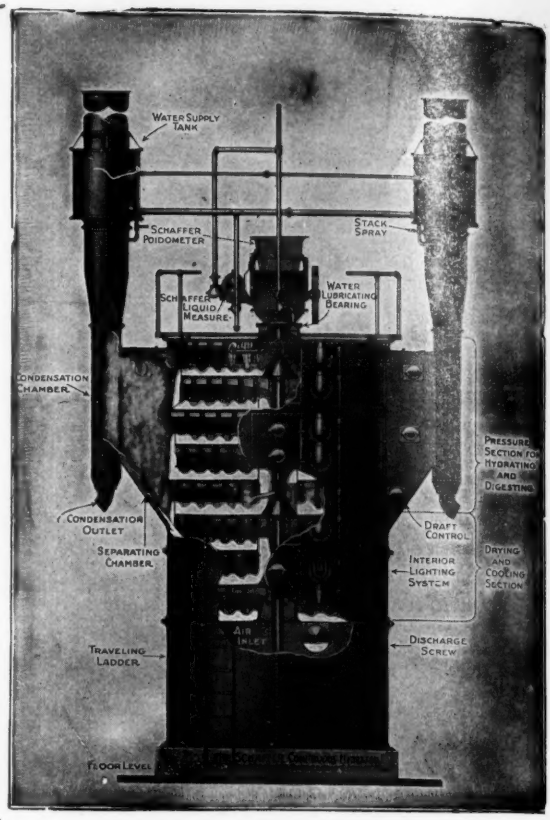
AUTOMATIC operation delivers lime by **weight**, not volume, to the Schaffer Hydrator. Automatically, water, too, is added in correct proportion—insuring a continuous flow of a superior product.

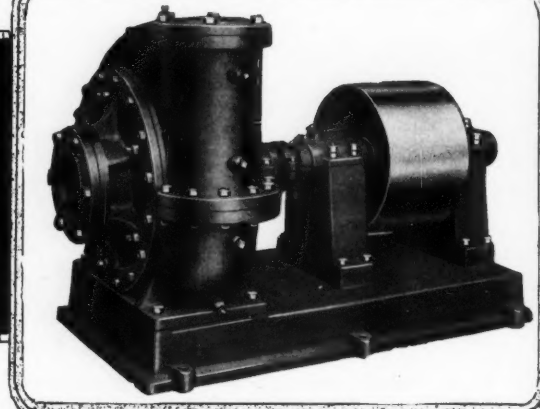
The flexibility of control enables the use of either high calcium or dolomite lime, while at the same time the automatic operation of Schaffer Hydrators solves the labor problem, as they require but little attention.

Our literature on the Schaffer Hydrator covers all the questions you now have in mind. Write for it at once!

Schaffer Engineering & Equipment Co.

Peoples Bank Bldg., PITTSBURGH, PA.





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Economy!

The Morris pump is an economical investment because of the ease of interchangeability. The manganese steel lining or any part of it can be easily replaced when worn. All adjustments are made from the outside. The outer casing is cast iron, and as it is protected from all wear by the steel lining, it will last indefinitely.

Write for Bulletin 19-B

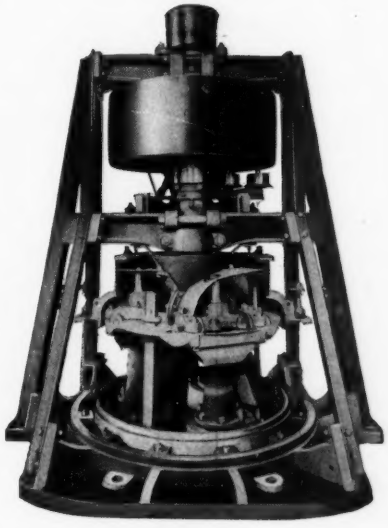
MORRIS MACHINE WORKS, BALDWINSVILLE, NEW YORK

Since 1864 builders of Centrifugal Pumps; Hydraulic Dredges; Steam Engines

BRADLEY

3 Roll Mill

The ideal pulverizer for the agricultural limestone producer who desires a uniformly finely ground, finished product. Produces a fine material cheaper than other types of machines that grind coarser.



Why Not Use the Best?

The Bradley 3-Roll Pulverizer insures maximum output at minimum cost.

A self-contained mill pulverizing rock from 1 in. to 70% through 100 mesh or finer in single operation.

Simple to operate. Low maintenance cost.

A real mill for agricultural use.

Bradley Pulverizer Co.

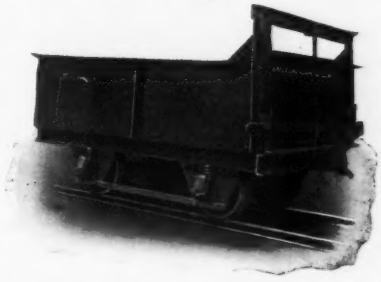
Boston **London** **Works, Allentown, Pa.**

Manufacturers Giant Griffin and Bradley Hercules Mills

EASTON

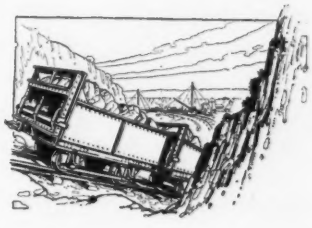
INDUSTRIAL RAILWAY

CARS



Quarry Car With Automatic End Door

EASTON CARS are available in every size and type suited to rock product service. "EASTON" on a car is the unfailing assurance for satisfactory operation, long life, and low maintenance. Quality is the prime consideration in the building of every Easton Car.



Skip, quarry, rocker dump, gable bottom, and scoop cars—any requirement, standard or special, can be met by the Easton Line.

Easton Engineers understand rock product problems. Use their services, which are free. And write for the Easton Bulletin, too.

EASTON CAR & CONS'T'N CO.

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Works: Easton, Pa.

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2100-E

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Browning Co.
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..... Bodies, Motor Truck.
..... Boilers.
..... Buckets.
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..... Cable Coatings.
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..... Hoisting Engines.
..... Hoists.
..... Hose, Air Drill.
..... Hose, Pneumatic Tool.
..... Hose, Steam.
..... Hose, Water.
..... Hydraulic Dredges.
..... Industrial Railways.
..... Lathes.
..... Lights, Carbide.
..... Lime Hydrators.
..... Lime Kilns.
..... Loaders, Car.
..... Loaders, Wagon.
..... Locomotive Cranes.
..... Locomotives, Electric.
..... Locomotives, Gasoline.
..... Locomotives, Steam.
..... Locomotives, Storage Battery.
..... Machine Shop Equipment.
..... Magnetic Separators.
..... Motors.
..... Motor Trucks.
..... Oil Storage.
..... Oils and Lubricants.
..... Packing, Hydraulic.
..... Packing, Piston.
..... Packing, Sheet.
..... Packing, Superheat.
..... Paints and Coatings.
..... Perforated Metal.
..... Picks.
..... Pipe, Iron.
..... Power Transmitting Equipment.
..... Pulleys.
..... Pulverizers.
..... Pumps, Centrifugal.
..... Pumps, Electric.
..... Pumps, Gasoline.
..... Pumps, Steam.
..... Pyrometers.
..... Rails.
..... Rock Drills.
..... Rope Drive.
..... Rope, Manila.
..... Safety Clothing, Etc.
..... Sand-Lime Brick Mchy.
..... Sand Pumps.
..... Sand Washing Boxes.
..... Scrapers.
..... Screening Equipment.
..... Screening Plants.
..... Screens.
..... Sheaves.
..... Steam Shovels.
..... Steel, High Speed.
..... Steel, Manganese.
..... Stokers, Automatic.
..... Stone Grapple.
..... Tanks, Steel.
..... Tanks, Wood.
..... Time Clocks.
..... Tracks.
..... Track Material.
..... Transformers, Electric.
..... Trip Hammers.
..... Unloaders.
..... Valves.
..... Washing Equipment.
..... Weighing Equipment.
..... Welding, Electric.
..... Welding, Oxy-Acetylene.
..... Winches.
..... Wire Cloth.
..... Wire Rope.
..... Wrenches.

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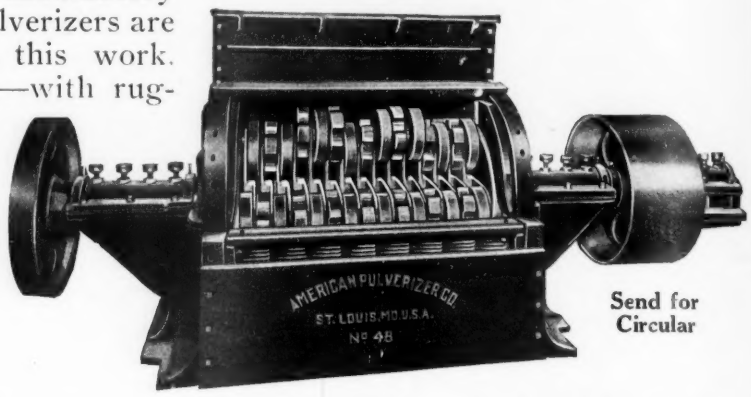

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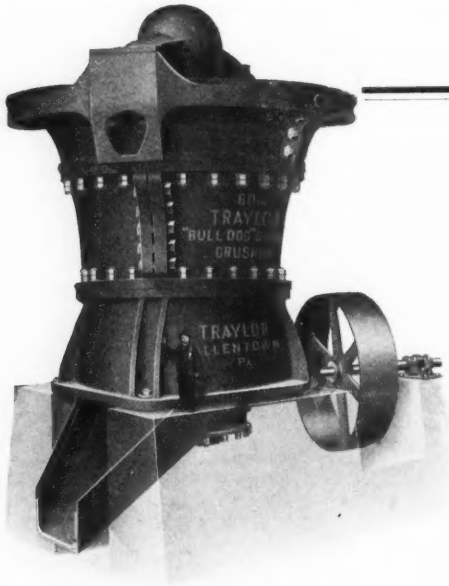

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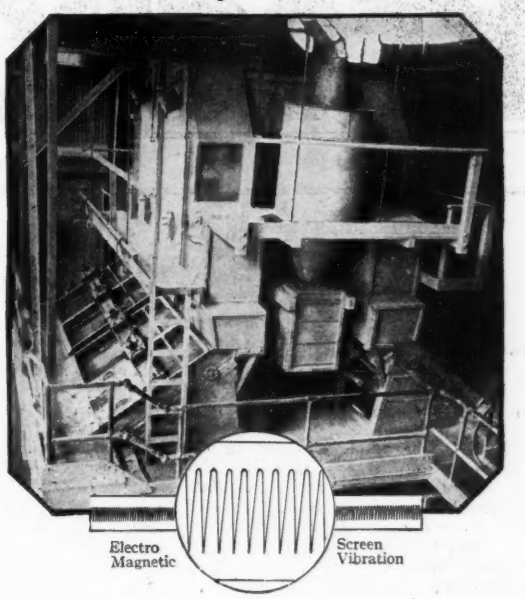

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